In Two Sections

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January, 1946

EDISON ELECTRIC INSTITUTE BULLETIN

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THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

October, 1944 and 1945

SOURCE AND DISPOSAL OF ENERGY—MONTH OF OCTOBER

	1945	1944	%
GENERATION* (Net)			
By Fuel Burning Plants	11,183,056,000	13,263,338,000	−15.7
By Water Power Plants	6,467,180,000	5,763,438,000	+12.2
Total Generation	**17,650,236,000**	**19,026,776,000**	**− 7.2**
Add—Net Imports Over International Boundaries	161,545,000	144,822,000	+11.5
Less—Company Use	119,289,000	132,645,000	−10.1
Less—Energy Used by Producer	131,552,000	109,116,000	+20.6
Net Energy for Distribution	**17,560,940,000**	**18,929,837,000**	**− 7.2**
Losses and Unaccounted for	2,658,734,000	2,470,245,000	+ 7.6
Sales to Ultimate Customers	**14,902,206,000**	**16,459,592,000**	**− 9.5**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of October 31st			
Residential or Domestic	28,029,863	27,365,948	+ 2.4
Rural (Distinct Rural Rates)	1,216,850	1,137,242	.....
Commercial or Industrial:			
Small Light and Power	4,359,363	4,251,784	+ 2.7
Large Light and Power	162,303	152,338	
Other Customers	118,771	117,402	.....
Total Ultimate Customers	**33,887,150**	**33,024,714**	**+ 2.6**
KILOWATTHOUR SALES—During Month of October			
Residential or Domestic	2,789,132,000	2,546,984,000	+ 9.5
Rural (Distinct Rural Rates)	390,455,000	373,479,000	+ 4.5
Commercial or Industrial:			
Small Light and Power	2,509,041,000	2,501,522,000	+ 0.3
Large Light and Power	7,826,351,000	9,559,275,000	−18.1
Street and Highway Lighting	196,550,000	192,730,000	+ 2.0
Other Public Authorities	555,137,000	655,787,000	−15.3
Railways and Railroads:			
Street and Interurban Railways	370,558,000	373,060,000	− 0.7
Electrified Steam Railroads	217,400,000	220,053,000	− 1.2
Interdepartmental	47,582,000	36,702,000	+29.6
Total to Ultimate Customers	**14,902,206,000**	**16,459,592,000**	**− 9.5**
Revenue from Ultimate Customers	**$271,413,100**	**$273,700,000**	**− 0.8**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—for 12 months ended October 31st			
Kilowatthours per Customer	1,208	1,137	+ 6.2
Average Annual Bill	$41.56	$40.14	+ 3.5
Revenue per Kilowatthour	3.44¢	3.53¢	− 2.5

(*) By courtesy of the Federal Power Commission.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 14 JANUARY 1946 No. 1

The Electric Light and Power Industry in 1945

SMALLER decline in industrial power use and more favorable outlook in electricity production than heretofore anticipated for the early postwar period; many requests for power supply for new business, particularly small and medium-sized industries—this sums up conditions reflected in year-end advices now being received by the Edison Electric Institute from electric utility companies in various parts of the country.

These developments are among the highlights of the story of the electric light and power industry in 1945 which covers the climax of the war's industrial activity and the country's precipitate entry into the postwar period. The year also brought to the fore the possibility of the use of atomic energy as a source of power.

Since the V-Days the generation of power has followed the course of industrial production after having made an all-time high record of 229,328,540,000 kwhr during the 12 months ending with July, 1945. The year closed with output running about 10 per cent under what it was at the end of 1944.

Continued and notable progress was made during the year in the growth of household electric service. Other classes, particularly industrial power sales, declined since August, reflecting the termination of war orders. For the year as a whole residential service showed the remarkable increase of 9 per cent over 1944. Small light and power and street lighting gained 1 per cent. On the other hand, electrified railroads lost 3 per cent and industrial service 6 per cent.

In spite of the difficulties of obtaining labor and materials for construction, nearly 800,000 more customers were added to the utilities' books, bringing the total at the end of the year to almost 34,000,000. A considerable portion of the 800,000 were farm customers.

Rural Service Extension

Further progress in extending service to rural districts was made during the year. At least 150,000 additional farms were added to the lines of the business-managed electric utilities, and REA reports indicate that 120,000 more farms were added on the lines of rural cooperatives. This brings total electrified farms to slightly over 3,000,000, which is over half of the 5,950,000 farms in the country. Two-thirds of all the farms are already reached by distribution lines, although about 30 per cent of those reached are not yet taking the service.

Only shortage of poles and materials prevented a further extension of rural lines in 1945. Assuming these shortages will be overcome, the utility companies expect to add about 600,000 farm customers during the next three years, with the result that in many areas, particularly in the northeastern, east central, mountain and Pacific areas of the United States, the extension of rural lines to serve all farms will be complete for all practical purposes.

Construction

Large expenditures for construction are contemplated for next year. Last spring the business-managed electric utility companies stated that they expected to spend $400,000,000 for additions to plant and equipment during the 12 months following V-E Day, as compared with actual expenditures in 1945 of $225,000,000. Indications at present are that this estimate will be reached and that the figure for the entire year of 1946, if ample materials and labor could be procured, would be double the 1945 expenditures.

Expressed in terms of actual physical volume of materials and employment however, total construction will probably approximate only the levels of 1939, because costs are now at least one-third again as much as they were in the immediate pre-war years.

New High in Household Use

In spite of the "housing shortage" more than two million new homes have been connected with electricity since Pearl Harbor in 1941.

Household use of electricity recently passed another milestone in the electrical progress of America in registering a figure of 100 kwhr per month per average customer. For the year 1945 as a whole, the average residential electrical consumption is estimated to have been 1225 kwhr, an increase of some 74 kwhr per year, or six per month, over the previous high record made in 1944. This gain took place in spite of the almost complete stoppage of the manufacture of appliances and is a striking example of the appreciation of electric service by the American public.

MAKE EEI CONVENTION RESERVATIONS EARLY—*PLEASE!*

The first postwar annual convention of the Edison Electric Institute is scheduled to be held in the Grand Ballroom of the Waldorf-Astoria Hotel, New York City, on Monday, Tuesday and Wednesday, June 3, 4 and 5, 1946. The many subjects calling for consideration by the Industry will crowd the program the full three days and a large attendance is expected.

The abnormally heavy demands on hotel service have made it possible to reserve only a relatively small block of rooms at the Waldorf for delegates to the meeting. Reservations in adjacent hotels will also be difficult to make.

Those planning to attend the meeting are therefore urged to send *as early as possible* their reservations direct to the hotels where they plan to stay.

SOURCE AND DISPOSAL OF ELECTRIC ENERGY, 1945 AND 1944

	1945*	1944	%
GENERATION (Net Kwhrs)			
By Steam Plants	140,250,000,000	152,443,660,000	- 8.0
By Hydro Plants	79,450,000,000	73,945,184,000	+ 7.4
by Internal Combustion Plants	1,800,000,000	1,800,000,000	-
TOTAL GENERATION	221,500,000,000	228,188,844,000	- 2.9
Add -- Net Imports	1,800,000,000	1,597,298,000	+12.7
Less - Company Use	1,450,000,000	1,691,853,000	-14.3
Less - Energy Used by Producer	1,850,000,000	2,393,616,000	-22.7
NET ENERGY FOR DISTRIBUTION	220,000,000,000	225,700,673,000	- 2.5
Losses and Unaccounted for	26,000,000,000	27,540,062,000	- 5.6
SALES TO ULTIMATE CUSTOMERS	194,000,000,000	198,160,611,000	- 2.1
CLASSIFICATION OF SALES			
NUMBER OF CUSTOMERS (December 31)			
Residential or Domestic	28,000,000	27,371,260	+ 2.3
Rural (Distinct Rural Rates)	1,220,000	1,144,241	+ 6.6
Commercial or Industrial			
Small Light & Power	4,380,000	4,263,395	+ 2.7
Large Light & Power	182,000	151,652	+20.0
Street and Highway Lighting	25,300	24,966	+ 1.3
Other Public Authorities	91,000	91,588	- 0.6
Railways and Railroads	213	217	-
Interdepartmental	1,487	1,073	+38.6
TOTAL ULTIMATE CUSTOMERS	33,900,000	33,048,392	+ 2.6
KILOWATTHOUR SALES			
Residential or Domestic	34,100,000,000	31,266,439,000	+ 9.1
Rural (Distinct Rural Rates)	3,650,000,000	3,372,943,000	+ 8.2
Commercial or Industrial			
Small Light & Power	30,250,000,000	29,837,317,000	+ 1.4
Large Light & Power	108,450,000,000	115,187,287,000	- 5.8
Street and Highway Lighting	2,185,000,000	2,162,655,000	+ 1.0
Other Public Authorities	7,425,000,000	8,462,816,000	-12.3
Railways and Railroads	7,265,000,000	7,328,439,000	- 0.9
Interdepartmental	675,000,000	542,715,000	+24.4
TOTAL KILOWATTHOUR SALES	194,000,000,000	198,160,611,000	- 2.1
REVENUE			
Residential or Domestic	$1,167,000,000	$1,097,725,500	+ 6.3
Rural (Distinct Rural Rates)	90,000,000	82,842,300	+ 8.6
Commercial or Industrial			
Small Light & Power	835,000,000	817,355,400	+ 2.2
Large Light & Power	1,014,000,000	1,043,391,800	- 2.8
Street and Highway Lighting	77,000,000	76,626,100	+ 0.4
Other Public Authorities	85,000,000	94,452,300	-10.0
Railways and Railroads	61,000,000	60,273,400	+ 1.2
Interdepartmental	5,000,000	4,084,600	+22.4
TOTAL REVENUE	$3,334,000,000	$3,276,751,400	+ 1.7

Residential Service - 1945

Kwhr per Customer - 1,225
Aver.Annual Bill - $41.90
Revenue per Kwhr - 3.42¢

* Actual data for 10 months, with November and December estimated.

Price Decline Against Other Living Cost Trends

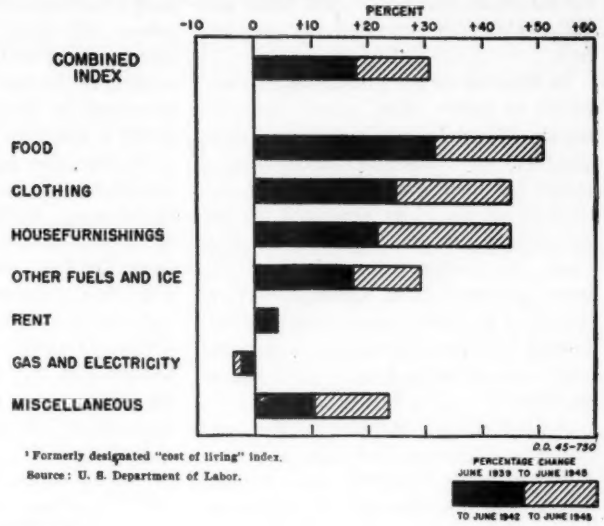
The price of electricity continued its decline. According to the U. S. Department of Labor, the cost of gas and electricity to the household consumer is now 95 per cent of the prewar base, as compared with a figure of 129 for the entire cost of living. Electricity and gas are the only items in the whole list of consumers' expenditures so reported which are cheaper now than before the war. Average unit cost of all electricity in the home has gone down over 14 per cent since 1939.

Estimated Revenues

The consolidated income statement of the business-managed electric utilities for 1945 showed little change from the previous year, with gross revenues substantially unchanged at $3,000,000,000 and net income about $10,000,000 or two per cent, above the $517,000,000 of 1944.

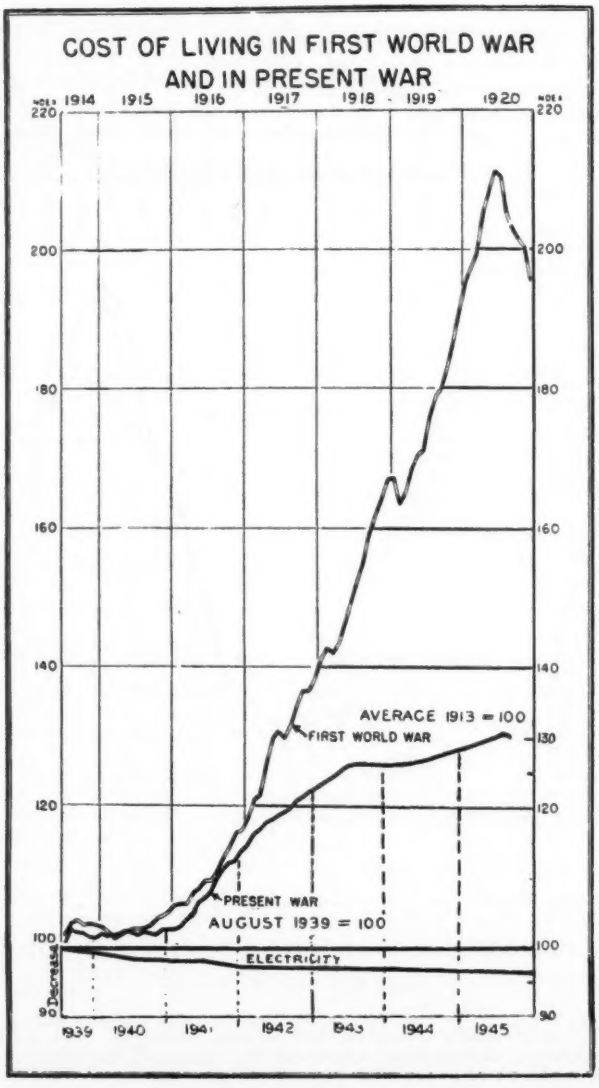
November 1945

Percentage Change in Consumers' Price Index, June 1939 to June 1945 [1]



[1] Formerly designated "cost of living" index.
Source: U. S. Department of Labor.

Chart from November 1945, "Survey of Current Business," published by U. S. Department of Commerce.



Further Increase in Generating Capacity

Installed generating capacity of all electric utility power plants, both public and private, reflected the tapering off of the war-time construction program. During the year, the net additions were about 750,000 kw, bringing the total at the present time to slightly in excess of 50,000,000 kw. The end of daylight saving necessitated the turning on of lights during the winter evenings an hour earlier than last year, with the result that the additional load upon the electric systems about balanced the loss of business through the termination of war contracts. The maximum demands (or "peak loads") in 1945 were thus not essentially different from those of the year before and are now estimated to have approximated 41,000,000 kw, leaving a reserve of some 9,000,000 kw, or 22 per cent above maximum requirements.

Output Approximates 221,000,000,000 Kilowatthours

Reflecting the increasing curtailment of business activity resulting from the ending of the war, electric output commenced in August to dip below the figures for the corresponding months of 1944 and ends the year with a decline of approximately 10 per cent. As a result, the production of electric power by all agencies contributing to the public sup-

ply approximated 221 billion kilowatthours in 1945; a decrease of 7 billion kilowatthours, or 3 per cent, from the 228,189,000,000 generated the year before.

In addition to the production of electricity by public utility plants, approximately 48½ billion kilowatthours were generated by industrial and railway plants for their own use, bringing the total of all electricity generated for all purposes in 1945 to 269½ billion. Also some 2½ billion kilowatthours more were imported from Canada, making the entire available electric supply of the United States to 272 billion. This compares with a similar figure of 282 billion in 1944.

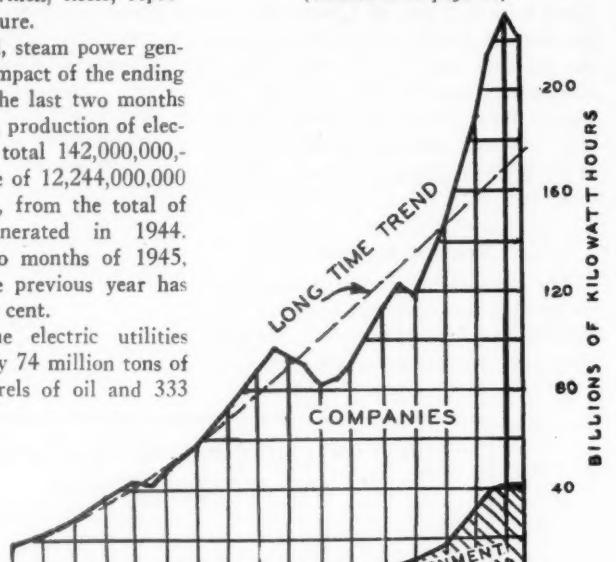
An outstanding feature was the continued production of hydroelectric power at record levels, combined with a large decrease in the amount of electricity generated by the use of fuels. This made possible a saving in coal consumption large enough to offset the effect of the increase in its price during the year.

Except for the Columbia River basin, water conditions in the United States were more favorable in 1945 than at any time in a decade, according to the Geological Survey of the Department of the Interior. As a result, hydroelectric generation—in spite of the large curtailment of war industries on the lines of the two principal hydroelectric producers, the TVA and the Bonneville Power Administration — reached the highest figure on record. With the months of November and December estimated, production of electricity by water power will total 79,000,000,000 kwhr, an increase of 5,055,000,000 kwhr, 7 per cent, over the tootal of 73,945,000,000 generated in 1944, which, itself, represented a new high figure.

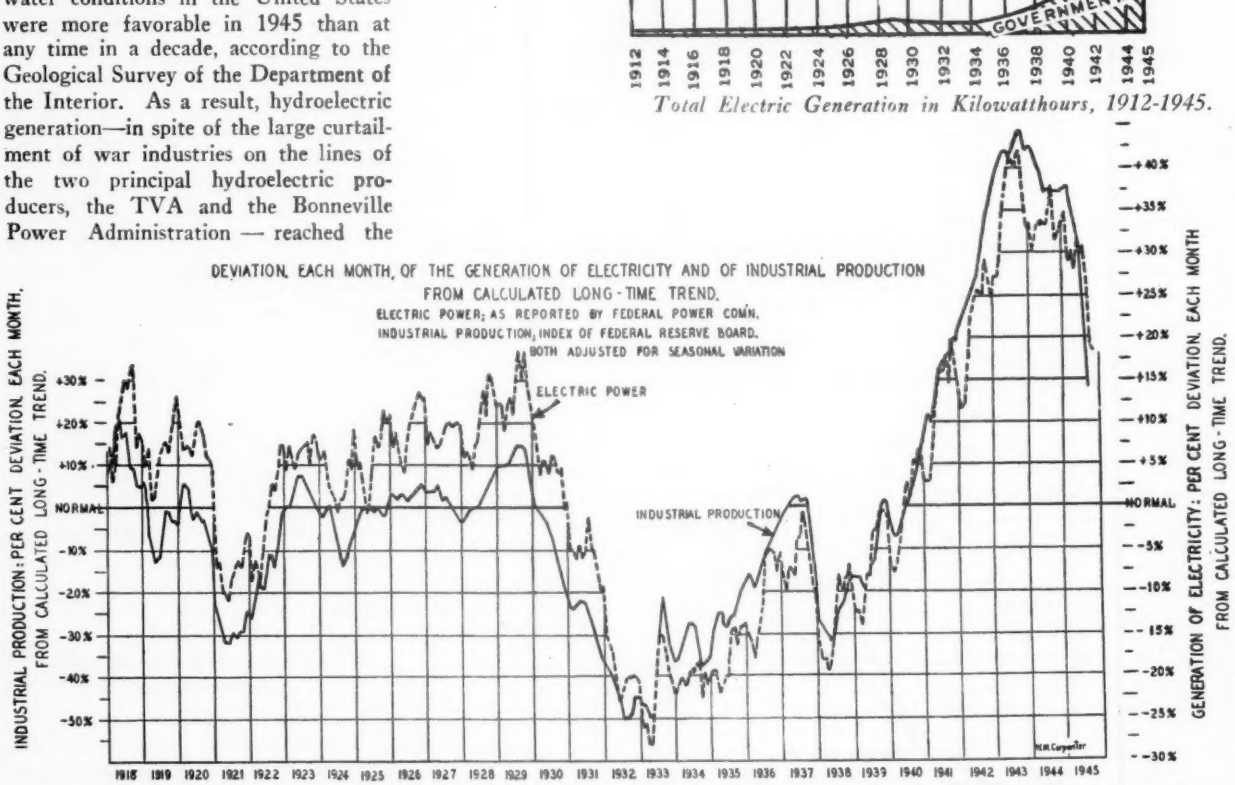
On the other hand, steam power generation felt the full impact of the ending of the war. With the last two months of the year estimated, production of electricity by fuels will total 142,000,000,000 kwhr, a decrease of 12,244,000,000 kwhr, or 8 per cent, from the total of 154,244,000,000 generated in 1944. During the last two months of 1945, the decline from the previous year has approximated 20 per cent.

During 1945, the electric utilities burned approximately 74 million tons of coal, 19 million barrels of oil and 333 billion cubic feet of natural gas. The corresponding figures for 1944 were 79,768,000 tons of coal, 20,759,000 barrels of oil and 357 billion cubic feet of gas. The saving over last year was seven million tons of coal or its equivalent in other

(*Continued on page* 14)



Total Electric Generation in Kilowatthours, 1912-1945.


DEVIATION, EACH MONTH, OF THE GENERATION OF ELECTRICITY AND OF INDUSTRIAL PRODUCTION FROM CALCULATED LONG-TIME TREND.
ELECTRIC POWER; AS REPORTED BY FEDERAL POWER COMN.
INDUSTRIAL PRODUCTION, INDEX OF FEDERAL RESERVE BOARD.
BOTH ADJUSTED FOR SEASONAL VARIATION
ELECTRIC POWER
INDUSTRIAL PRODUCTION
INDUSTRIAL PRODUCTION: PER CENT DEVIATION, EACH MONTH, FROM CALCULATED LONG-TIME TREND.
GENERATION OF ELECTRICITY: PER CENT DEVIATION, EACH MONTH FROM CALCULATED LONG-TIME TREND.
+30% +20% +10% NORMAL -10% -20% -30% -40% -50%
+40% +35% +30% +25% +20% +15% +10% +5% NORMAL -5% -10% -15% -20% -25% -30%
1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945

ELECTRIC POWER AS A MEASURE OF THE EBB AND FLOW OF THE BUSINESS TIDE OF AMERICA

The "Business Cycle" and its Relationship to Industrial Production and the Output of Electricity.

(Note: Electric power production covers public utilities only. The fluctuation of power generation has been exaggerated by drawing its scale twice as large as that of industrial production. The irregularities, giving the curve a saw-tooth appearance, are largely the result of unpredictable weather conditions. The smallness of the steeple in the summer of 1933 emphasizes the futility of government planning, as illustrated by the NRA.)

Tax Exemption Threatens National Economy

By C. W. Kellogg
President, Edison Electric Institute

A talk before the Economic Research Round Table, New York, Jan. 8, 1946

ON New Year's Eve, the New York *Times* contained a statement with modest mid-page headline entitled "One Year Maturities of U. S." There were thirty-one of them and they aggregated over 66 billion dollars. This list included nothing for Series E, F and G bonds which are, of course, cashable at any time on short notice. This news item in size, location and prominence received less notice than the day's grist of wedding and engagement announcements. I should like to take this as a text for my brief remarks today.

If *a commercial concern* owed within a year several times its gross annual revenues in a situation where the only *permanent* way of discharging its debt was from what it could save from those gross revenues, its financial plight would be deemed hopeless; yet, based on the slight treatment accorded it by a newspaper like the New York *Times,* the public would seem to be treating this very serious situation with ostrich-like indifference.

No one would question the necessity for the creation of the major part of our huge Federal debt due to the war. It had to be contracted to keep our country free; and whatever had to be spent for this purpose was mandatory, because it was the choice between life and death. But now that the debt has been contracted by the Government for the benefit of its citizens, it behooves that same Government, for the salvation of its citizens, to do everything in its power to help its citizens to recover from the heavy blow the war has dealt them.

The two ways in which the Government can help in this process are (1) to avoid borrowing any more money and (2) to give the enterprise and initiative of its citizens the most unfettered scope for development. There are many paths that this governmental help can follow along the lines of the strictest economy in governmental operating expenditures and the avoidance of every plant expenditure not desperately needed; but the particular one I should like to discuss is the tax exemption situation and its extension in recent years.

The original theory supporting a given exemption from payment of taxes was that the concern in question, like a church or college, was supported by voluntary donations for some high public aim, not operated for profit, so that taxes of any kind would simply restrict the benevolent activity of an enterprise for the public good. The same theory justified exempting governmental property from taxation, since the taxation of such property meant merely taking money from the right-hand pocket to put it in the left.

How Government Competition Works

Where the theory failed, and, instead of helping worthy public projects, became a direct attack on citizens, was when the Government went beyond its essential function of governing and entered into business, competitively with its own citizens.

Even if it were conceivable that a governmental business enterprise should be theoretically set up to be fairly competitive with private enterprise, experience has shown that it would not work satisfactorily. This is for the reason that any governmental enterprise is a political proposition, with the result that its policy, its appointments to office and the size of its payroll come to rest on politics rather than efficiency. A governmental business lacks entirely the necessity which every private business faces: of either making both ends meet or going out of business. A classical example is the New York subway system which, while ostensibly paying interest on its bonds, is prevented by political pressure from charging a rate of fare that will make the earning of that interest possible, with the result that the taxpayers get stuck to the tune of about $55,000,000 a year to keep the enterprise in operation.

In recent years, however, even the pretense of fair competition by government in business has been cast aside in enterprises like the TVA, which pays no Federal taxes and practically no interest on the investment of the taxpayers' money in the enterprise. In a water power development fixed charges on the investment comprise about 90 per cent of the cost, the water itself being a free gift of nature, so that when the lion's share of the costs are disregarded, naturally relatively low total costs would be shown. Some might say (as many do, without thinking the proposition through) that it is all right for the Government to use its credit to produce low costs, but for several serious effects that have to be taken into consideration:

1. The fact that the governmental enterprise doesn't pay taxes or interest does not mean (as some people fondly imagine) that these charges are not paid. They are paid by other taxpayers who do not enjoy the exemptions. Many people profess to believe that this arrangement is all right on the theory of sharing the wealth, but they overlook the second point.

2. Taxes are paid from the earnings of private enterprise. A governmental business enterprise, to the extent that it fails to earn true charges, becomes a twofold burden on the community: first, in that, when carried to the limit, private enterprise could not carry the burden; and second, that the effect of charges-exempt competition is to reduce profits to, and therefore taxable income to the Government from, private enterprise so competed with.

3. It must be obvious that this trend toward state socialism (where everybody is more interested in what he gets than in what he produces) cannot be carried by an economy which, like our own, is already burdened by a national debt of 270 billion dollars which will doubtless rise to at least 300 billion before the costs incidental to cleaning up war commitments are liquidated.

In a word, government competition with its own citizens, on a basis of exemptions from interest and taxes, becomes the most tragic example of all time of killing the goose that lays the golden eggs.

Excursions into Business Interfere with Normal Government Functions

One of the most serious results of government going into business is also exemplified in the experience just re-

ferred to of the City of New York. The whole purpose of government is the performance of those activities for the safety and health of the community that cannot be effectively performed by individuals for themselves. With the growth in complexity of modern life and the constantly rising standards of living, these governmental functions have tended to broaden out into new fields and to develop and ramify in the old fields. Every excursion by government into a field like the New York transportation system, which is not a necessary governmental function at all, exhausts just that much public credit and to that extent weakens or restricts its ability to care for the many essential governmental functions that press for attention from time to time. Mayor O'Dwyer's message of this week on this subject is but the last of many similar pleas all arising from the same cause, of a government wasting its economic forces by its excursions into non-governmental enterprises.

In the case of the City of New York, the limitations arise from the statutory debt limit. For the Federal Government, however, no such statutory limitation exists and the only safety feature must be the sense and restraint of the people. That is why informed economic thinking is so essential to protect the people from being ruined by the very government they have set up to protect themselves from harm.

Its Insidiousness

The greatest difficulty, in presenting adequately and convincingly the evils of government subsidy for government business enterprise is its insidiousness. The whole economic structure of the country is so huge that it is often difficult to realize the end effect of a given policy from the specific effect of one case. It is too bad that the man on the street is not familiar with the theory of the calculus, for it would make the picture crystal clear. In the differential calculus the approach is to show the relationships between a tiny but representative set of quantities; then the end result is the integral of all the differentials.

Thus, for example, TVA. Its total investment of say 750 million dollars is but a quarter of one per cent of the total Federal debt—which alone could neither make nor break the country. Its tax and interest exemptions amount to about 28 million per annum, or about one-tenth of one per cent of the Federal Government's annual income—from that viewpoint a relatively trifling sum. But both of these, integrated throughout the business structure of the country, would produce a result wherein (1) simply staggering sums would be borrowed, (2) tax income to support such debt virtually destroyed and (3) complete financial chaos would result. The only sane thing for an intelligent country to do is to think through this simple calculus problem before rather than after, the damage has been done.

Pyramiding Effects

It is interesting to observe how the effects of tax exemption pyramid in the case of the acquisition of an electric utility property by a governmental body. Tax exemption tends to increase net earnings, but it also decreases the government income by the same amount. Since the price of a utility property is based largely on capitalizing net earnings, the result is a higher price paid by the government for the property than would be justified but for the exemption. Then, finally, the money is raised by the sale of tax-exempt revenue bonds, so that the U. S. Treasury loses the tax on the income which their interest represents to the holders of them.

Kinsey Robinson, in a recent presentation to a Congressional committee, has given a concrete example of how tax exemption brings losses to the Federal Treasury over and above what the property itself does not pay. He compares two citizens, A and B, each with $5,000,000. A buys tax-free bonds of the Consumers Public Power district and B the most recent issue of New Orleans Public Service bonds. Even though the gross yield of the New Orleans bonds is 34 per cent greater than that on the Public Power bonds, the net income after taxes of B, who bought the New Orleans Company bonds, would be less than one-third that of A with his Public Power bonds.

Unfairness of Government Competition

Even if, after considering all of the foregoing, one should still believe that government business enterprises were for the general welfare and therefore should be exempt from taxation, it is impossible to wave aside the unfair competition involved. When, for example, the results of heavily subsidized government business enterprises are claimed by the government to be a "yardstick" for measuring the charges of private enterprises which do not enjoy the subsidies, a degree of injustice is involved that should be shocking to the fairminded person.

As indicating the relative magnitude of the tax exemption subsidy in the electric utility business, the total of taxes paid by such companies in 1943 was 680 million dollars. This was 1.83 times total payroll; it was 1.88 times total fuel cost; it was slightly more than the entire combined amount paid for interest on bonds and dividends on preferred and common stocks. The significance of this latter statement can be best appreciated in connection with the fact that the electric utility business requires seven times as large an investment in fixed capital as the average industrial concern, so that charges on investment are the largest item of expense for a utility enterprise. In 1943, taxes and return on investment represented over 51 per cent of the costs of the electric utilities. How could competition with a government enterprise that assumed neither of these costs be anything but devastatingly destructive?

Unfair combination in restraint of trade has been unlawful in this country for nearly sixty years and for twenty-five years the Federal Trade Commission has been functioning to abolish unfair business practices. Yet right today the competition of government with its own taxpaying citizens in the electric utility business is more drastic in effect than the freight rate rebates of the Seventies that led to the passage of the Interstate Commerce Act of the Eighties.

Growth of Tax Exemption

To indicate how the tax exemption evil is growing, it is instructive to consider the development of the cooperative movement in our country. This started in a small way as a joint purchasing plan for farmers. It was given tax-exempt status by Congressional enactment as supposedly a sort of charitable movement. By expansion and combination it has now become big business and, according to a statement of the Cooperative League of the U. S. A. which appeared in the New York *Times* recently, cooperatives own eleven oil refineries, 500 producing oil wells and 139,000 acres of oil lands; they also own a fertilizer factory and coal mines and are active in the insurance field.

For the fiscal year 1944, the Farm Credit Administration reports cooperative income at $5,160 million and the

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1946 Starts With a "Warming Up" Period

Preparation Being Made for Selling Competitive Market

By C. E. Greenwood
Commercial Director, Edison Electric Institute

WE "ring out the old and ring in the new" during a confusion of international politics, internal labor strife, shortage of basic materials, OPA pricings, plus other situations which retard our vision of sales opportunity in the electrical field. Industrial production of important electrical items to fill the public needs lacks momentum. Wartime blue-prints designed for prompt postwar action, and charts of hoped-for achievements in the peacetime months, are all askew and already require revamping.

During the war years the appetites of millions of men and women were whetted with the desire for new household appliances, some patterned on the basis of 1950 imaginations. National magazines recorded the express will of consumers on what they would buy first. Retailers had their cash registers well oiled to stand the influx of cash sales from hoarded savings. War bonds as first payment on major equipment would be accepted. Many utilities were ready to stand aside, and to soft-pedal promotion while the orgy of buying these articles of utilization was in progress.

This was an exciting and satisfying picture for those engaged in the problems of distribution. The months since V-J Day have not revealed this picture. Efforts to contribute towards more and better jobs are bumping into slow-downs of desire to engage in selling on the part of the G-I's.

However, persons assigned the responsibility of charting a course of market development for the first full postwar year received a boost in their morale from the message of the President of the United States to the first National Marketing Forum, sponsored by the Sales Executives Club of New York, recently held at the Waldorf-Astoria. President Truman asserted that "Goods produced must be marketed, promoted, advertised, and sold—for enjoyable, beneficial use by consumers, or production will not continue.

"We have proved our ability to produce," he said. "Now we must demonstrate that we can sell into consumption or use the full output of full employment. It will require the complete mobilization, the thorough training, and the effective work of the millions engaged in the processes of advertising and selling.

"I am confident that American business can and will do this. Your Forum has a real responsibility to challenge everybody in advertising and selling to this important and immediate task."

Executives had hoped that this mobilization of human sales potential might accompany the demobilization of members of the armed forces. But there appears to be a desire on the part of returning GIs to take a rest period before tackling a job, either old or new. How aptly the situation in the field of distribution was stated by Paul G. Hoffman, President of the Committee of Economic Development to the same Forum.

Said Mr. Hoffman, "I believe you men in the merchandising field face greater reconversion problems in some respects than those which we in industry are struggling with. Not only must you put back together the sales forces of the Nation scattered by war, but you have to resell 'Selling' as a profession. I believe that one of the things that American enterprise needs most right now, is at least 5,000,000 hard-hitting, scientifically-trained, and well-paid salesmen."

In an earlier issue of the EEI BULLETIN, the writer pointed out that sales training was the number one need in the electrical industry and outlined a proposed Sales Training Program which the Institute was undertaking for the benefit of the entire electrical industry. It is gratifying that the first units of this program—a course on Basic Sales Training, including eight sound-slide films and records, silent trailer films for analysis of sales situations, salesmen's manuals, and instructor's guides, are now being distributed.

The reception to the EEI Training Program has been highly satisfying. More than half of the original allotment has been sold before public showings. Now with the assistance of National Electrical Wholesalers Association which has consulted with the Institute in the development of the Basic Sales unit, joint effort is being made f previews in different sections of the country in order that more of the industry branches may receive first hand knowledge of the thoroughness of production, and the possibilities of effective application.

Other units of the program applying the Basic Sales technique to selling services in the residential, commercial, rural, and industrial sales fields, will follow.

Now until a base for full reconversion can be obtained, we cannot tackle the market for equipment. As labor has its "Cooling Off" period, so the commercial forces of the Institute are using this enforced lull in production as a "Warming Up period." All committees are on the alert and are preparing promotional tools for the benefit of the utilities and others desiring to use them. They will be available on an equitable basis and wide demand is anticipated.

Always a fundamental consideration, wiring has a lead place in promotion. The Adequate Wiring Bureau has functioned effectively since 1938 in the Residential field. It will use again this year, as its Standard, the specification of the Industry Committee on Residential Wiring Design of which E A Brand of Buffalo Niagara Electric Company is Chairman. There are ten technical and professional associations represented on the Committee.

Over several decades, wiring standards have been continuously raised to meet the ever-accelerating demand for more electric service. The essentials of greater copper capacity and more circuits and outlets are included in a new Handbook on Residential Wiring Design, due off the press the middle of February.

There should follow in a month to

six weeks a companion Handbook on Farmstead Wiring Design, the first industry specification of its kind. Advance orders for these publications at Edison Electric Institute totaled more than 100,000, which is an indication of the attention to be given by the industry to this subject.

Supplementing these publications, and to tie in with them, the Institute is preparing a Wiring Primer which includes Chapters on the fundamentals of wiring; the residential needs and application of wiring; and the commercial needs and application of wiring. Still another promotional "tool" now in process is a series of prepared "lectures" on wiring, each illustrated with colored slides. This will be helpful to one versed in the subject in presenting the message to local groups.

We are also preparing a promotional program on the All-Electric Step-Saving Kitchen which will include a Kitchen Planning Manual, together with handout folders for meetings of all classes such as local Home Planners Institutes, cooperative meetings with local Building and Banking groups and women's gatherings. The modernization phase will be emphasized as well as the planned electric kitchen in the new home.

Few persons concerned with electric cooking promotion are not familiar with the recipe book "Meals Go Modern Electrically," a product of the former Modern Kitchen Bureau. This is the leader in the field of this class of publication and demand has been nearly a million. Present supply is exhausted, but a revised edition is in progress and will be reissued as promptly as printing conditions permit.

The motion picture in technicolor—"It Happened In The Kitchen," a thirty-minute, enlightening and entertaining story of electrical modernization and transformation of the old kitchen—is once again available now that restrictions on films have been removed. These tools for promoting electrical kitchen equipment are just some that are being prepared during this "warming up" period, which it appears will continue for at least the first quarter of 1946.

Today millions of prospects are living in areas where low competitive rates for water heating service are available. The Water Heater Section of NEMA has announced a promotional booklet which it will offer to the industry. The Institute will supplement this publication with mailing pieces for utility companies to assist in further developing the market. Our Electric Water Heating Committee is now giving thought to the preparation of copy and the mechanics of production of these items for promotion of the water heater market.

Entering the field of lighting, we naturally start with the plans of the Better Light Better Sight Bureau, which is now in its twelfth year of continued promotional effort along educational lines. The obligation rests upon industry units to re-sell adequate lighting levels for seeing tasks in all market classes. Long standing orders for the sound-slide film SEE FOR YOURSELF have been distributed. Another film, LET THERE BE LIGHT, gives emphasis to the improved safety factor in driving on the highway and protection from crime through sufficient and correct illumination.

The Disney film in technicolor! Have courage — those who ordered — because restrictions on film are removed, strikes are over in Hollywood, and delivery is really promised for mid-February. Available with it are the supporting mailing pieces, charts and newspaper mats for promotion.

Then the organization lighting committees of the Institute are laying the foundation for re-lighting and re-fixturing of homes and commercial establishments. First, however, is the basic consideration of "Certified" fixtures for the protection of the home buyer if, and when, fluorescent light sources invade the home market. The commercial market is better protected. Indications are that the kitchen will be the first room in the home to gain the attention of the fixture industry. A set of specifications, prepared to assure technical excellence in production and illumination satisfaction in application, is now being constructed. Highly improved fixtures are expected to be on the market in late Spring. New opportunities for selling them are ahead.

What will the Homemaker buy for her seeing tasks? What fixtures will the smaller industrialist buy for re-lighting his plant? What will the merchant buy for light for selling? They must all be guided in their choice and will require, and the utility salesman will be obligated to give them, sound advice along these lines.

Numerous "Manuals" are in the making with informational material. Companies that are planning to promote the commercial cooking market will find helpful assistance to their sales specialists in the new Cooking and Baking Manual that is about ready for printing.

And speaking of Manuals, the existing Industrial Power Sales Manual is being enhanced in value with the addition of four new sections, and the revamping of two others.

An authoritative treatise on the Installation, Servicing and Selling of Electric Water Systems, the result of thoroughness in survey and planning on the part of the Pump Manufacturers, in consultation with utility men, is soon to be released through the Electric Water Systems Council. It is intended to not only guide the buyer of a water system, but to act as a bible of information on this subject for instructors in Agricultural Colleges, County Agents and others.

Still another Manual in the making covers Farm Utilization Equipment and Applications. It is to be patterned after the popular Power Sales Manual, and the Rural Section gives printing time for the first sections as this Spring. Here again, the Rural Service Salesmen, and all others concerned in rural electrical development, will find authoritative information on numerous electrical applications to serve the farmer in his production problems.

Committee consideration has been given likewise to the problems of Distribution of farm equipment. Distribution was acknowledged to be quite imperfect in pre-war days, and a subject that should be brought beyond the stage of discussion to the stage of fruition. Progress is being made to this end by certain leading manufacturers and wholesalers. The farmer needs more and better ELECTRICAL equipment, and he likes to see it before he buys it. Better methods of display and more intensive sales effort are "musts."

Hundred of thousand of farmers are being connected to utility lines each year and will be ready to experience the benefits of electricity. Here is opportunity and likewise responsibility for the rural service representatives of utilities. Here again manufacturers and distributors of production equipment should dovetail their efforts in presenting the benefits of electrical labor to the farmer.

From time to time in discussions of

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Electric Service in a Great City

From Horse and Buggy Days to the Present

By H. P. Liversidge

President, Philadelphia Electric Company

This address, based upon authoritative and contemporary sources preserved among the Philadelphia Electric Company's records, was delivered at the "1945 Philadelphia Dinner" of The Newcomen Society of England, at which Dr. Liversidge was guest of honor, held in the ballroom of the Bellevue-Stratford, Philadelphia, Nov. 28, 1945. Dr. Liversidge was present at many of the interesting events he describes in the address.

The many problems faced by Philadelphia's pioneers in making electric service available to the consumer are typical of those faced in every part of the nation by infant electric companies. The history of one utility's growth to maturity is, in a sense, the story of the development of the entire electrical industry.

This address, under the title "Electric Service in Philadelphia—Since 1881," has been printed in a very handsome illustrated brochure by The Newcomen Society of England, American Branch.

WHEN one compares *the electric industry* in Philadelphia with other important industrial organizations in this city, many of which have flourished here 100 years or more, he must accept the fact that it is part of *a younger generation*. It would seem a fortuitous circumstance that the days of its years have spanned the most eventful era the world has ever known, for thus was *Electricity* enabled to contribute something to the inventive genius that enabled Man to fly in airplanes, to navigate the depths in submarines, to project his voice around the world by radio and telephone, to travel by automobile, trolley car, and electrically-propelled railroad train, to enjoy talking moving pictures, recorded speech and music and, more recently, to benefit from the modern miracles of radar and other new electronic developments.

Dr. Benjamin Franklin proved that lightning and man-made Electricity were identical when he conducted his kite experiments in Philadelphia about 1750, but it was not until *more than one hundred and twenty-five years later* that the business of generating and distributing Electricity emerged as a new enterprise. In the two succeeding generations—that is, from about 1875 until today—the perseverance and skill of scientists and inventors bestowed on Civilization greater and more diverse benefits and material possessions than have come from the wise men of all prior generations. Among the greatest of these was the knowledge of how to produce and utilize Electricity —a controlling factor in the Age of Power.

Centennial Exposition of 1876

The beginning of the electric-lighting industry was preceded by a flurry of inventions, which swept the country and formed the basis of great industrial advances. Amid this wave of new ideas and discoveries arose the *Philadelphia Centennial Exposition of 1876,* to commemorate the one hundredth anniversary of the signing of the Declaration of Independence.

Dynamo and Arc Light Exhibits

Among its most inconspicuous exhibits was one in the French section, consisting of a small steam engine belted to a Gramme dynamo, and a second electric machine, driven by the first, that operated a little pump which raised water to an elevated vessel. In an adjoining tank, another part of the dynamo current was electroplating objects with silver. Simply to attract attention, the exhibit featured a tiny electric arc, which burned brightly inside an open glass globe.

In another part of the exposition, a third dynamo was exhibited by an American concern. It was more awkward than the others, and larger, yet it could supply enough current for only one arc lamp. Sometimes at night this dynamo was connected to a light outside the peak of the building.

Public Apathy

The crowds stopped to gape at these exhibits, but that was all. Epoch-making as they ultimately proved to be, few realized then what they meant, or guessed how soon they would be called the newest wonders of the world. The throngs that crowded into the Centennial Exposition simply were not electrically-minded, and these modest exhibits attracted little popular attention, in fact, they were completely overshadowed by a 1000-hp Corliss steam engine, whose colossal size and rhythmic action held spectators spellbound.

It is easy to understand this apathy towards things electrical, because at that time the electrical industry, as we have since come to know it, was a virtual nonentity. There was as yet no dynamo-electric machine worthy of the name, because the clumsy apparatus then available was little more than an elemental experiment in electro-dynamics. There was no electric lamp that seemed to have much chance to supplant the then satisfactory gas light; and there certainly was no equipment to utilize electric current in the home or factory, nor switches or other protective devices to control it, that had been projected beyond an experimentally-promising stage. Electric Power, as an integral part of the possibilities the optimists of the mid 70's were dreaming about, was absolutely unknown. Their sights were concentrated on Lighting.

Horse and Buggy Days

Those were really the true horse and buggy days, with local travel limited almost entirely to this form of conveyance, although there were some wobbly horse-drawn cars on main streets in larger communities, and a smattering of cable cars. Steam railroads were just reaching the point where travelers could expect reasonable accommodations for journeys more than a few hundred miles.

Although a few enthusiastic backers had awakened to a realization that it was possible to talk over short distances by wire, the entire telephone plant of the world could, at that time, have been carried in the arms of a child, consisting as it did of two crude receivers, which served also as transmitters, and about 100 ft of wire!

There was absolutely no conception of such things as airplanes, automobiles, X-rays, radios, moving pictures, or sound recordings.

There had been a gap of 32 years between the *telegraph* of Morse and the *telephone* of Bell in which very little progress was recorded; but behind the scenes, imaginative genius had started to concern itself about things electrical. Men with scientific and inventive minds were burning midnight oil studying the basic principles of the dynamo, and its applications, for the promise of profits was most alluring. There was little to guide them, however, other than books

on physics, since in no institution of learning in all the world was a series of studies in Electrical Engineering to be found. Such a course was yet to be evolved.

Visionaries of the 70's

Although public interest in this new art was at a rather low ebb, this did not prevent inspired men from forging ahead, even though they had little more for a beginning than a dynamo of primitive design, a crude arc lamp that produced a blinding light—*and a vision*. This vision was like the spark that starts a conflagration when the stage is set, because it fired the imagination and quickened the zeal of young enthusiasts such as Brush, Thomson, and Edison, to mention but three.

Brush

Charles F. Brush, then 27 years old, was a remarkable young man. He started experiments in Cleveland in 1875 on a small electric machine, and by the following year had developed an arc light and a dynamo that really worked. In 1878, John Wanamaker contracted with him for the installation of 20 arc lights for his then new store in the rehabilitated freight depot of the Pennsylvania Railroad at Thirteenth and Market Streets. These lamps, which were the first to be installed in Philadelphia, became one of the wonders of the day.

Thomson

Elihu Thomson, another electrical genius, likewise attained his place in the scientific world in his early twenties. When he was but 21, his talents won for him the post of professor of mechanics and chemistry at the Boys Central High School in Philadelphia. In 1876, when he was but 23 years old, he was invited to give a course of winter lectures on Electricity at The Franklin Institute of the State of Pennsylvania, at Philadelphia. He built a small dynamo and an arc lamp for demonstrations during the lectures, and both pieces of equipment became sensations. In 1877, the first dynamo tests ever made were carried out in The Franklin Institute by the famous professional team of "Young Mr. Thomson" and Prof. Edwin J. Houston, his colleague at the high school, a combination that produced many important contributions to the development of Electricity.

Edison

Meanwhile, *Thomas A. Edison,* the paragon of them all, was laboring most assiduously at Menlo Park, New Jersey, formulating the essential requirements of an electric system. After many trials and disappointments, in 1879 he exhibited to his financial backers a number of carbonized-filament incandescent lamps lighted from a Gramme dynamo. Nor had he been content to work on lighting alone, for when told of the results of the tests on dynamos made by his contemporaries at The Franklin Institute, he forthwith applied himself to design a better and more efficient machine!

Early Electric Problems

As time went on, Edison concentrated more and more on two very pressing electric problems. One was to find a more practical filament for his incandescent lamp. The other, which was equally important, was to find a way to keep an electric lighting circuit intact after one of the lights connected to the circuit had failed. This was quite an assignment, because the incandescent lamps of those days were connected in series and when one light failed the entire circuit failed. Brush claimed to have anticipated Edison's solution of this latter problem by at least one year, although he held back his patent application until 1885, when it was contested by the examiners and not finally granted until 1902—a delay which cost Brush vast sums in royalties.

Although Edison and Brush and Thomson were towering figures in their chosen field and all of them forwarded greatly the development of the infant electric industry, Edison got at least public credit for solving most of the urgent problems and his name always will be synonymous with electric progress. Even today his influence is widely felt! Not only was he a colorful genius, but his inventive capacity served as an incentive for others who tried with him to open doors to new discoveries.

Evasiveness of Success

Important advances in any field of endeavor invariably collect a heavy toll in the form of heartaches and disappointments. The electric industry was no exception. Behind the developments that produced its growth were more perhaps than a fair share of tantalizing failures. Many of them tried the faith and patience of pioneers in this field from whom success was withheld in some instances for months and even years. Edison, for example, is said to have tried thousands of substances—even red whiskers from a friend's beard—in his quest for a better filament for his incandescent lamp before he accidentally found success in bamboo.

Distribution Difficulties

But making a lamp that would burn for even 24 hours was only a small part of the whole problem. There was, for instance, the matter of distributing the Electricity, which was supplied as direct current, or *"D.C.,"* as it was later called. Edison had committed himself completely to the use of direct current, and his plan of distributing it was the most advanced of the time, being through a system of *parallel supply* rather than a *series supply*. A grave limitation, however, due to the low voltage—110 and 220 volts—was that the investment in copper mains for transmitting the energy any considerable length increased far out of proportion to the distance traversed. This shortcoming was at first overcome by building power plants in the center of areas of greatest demand, and extending the transmission lines for six or eight city blocks. Additional plants were planned to be built as necessary. Several objections to this method immediately were evident. In the first place, the location of the generating plants was determined by one condition and one only, namely, the concentration of the load to be supplied. Presence of railroad facilities, land costs, and other important considerations were relegated to the background.

First Use of A.C. Service

These difficulties, plus the continuously growing demand for electric service, led inventors to cast about for a more satisfactory means of distribution. The initial approach toward solution came in 1885, when the first commercial distribution system using alternating current was installed in this country. This was a revolutionary influence throughout the industry, because alternating current proved to be the secret of man's production of Electricity and high voltage transmission of this Electricity over extended distances. Without this advantage, the great regional power pools of today would be impossible.

Early Obstacles

There were obviously many other obstacles to be overcome, for it must be remembered that all apparatus used to generate, distribute, and utilize Electricity in those early days was new and untried, very inefficient, and altogether unreliable in operation. In addition to these operating and Engineering cares

there were many personnel problems, for it was necessary for the operators to train staffs to handle the expanding business, to say nothing about the need of the managers and operators to acquire some empirical knowledge themselves!

An added difficulty always present, like taxes, was a widespread *fear* of Electricity. As a matter of fact, this "flooid" was considered so dangerous that fire insurance was difficult to obtain on premises wired to use it, or on the power houses that produced it.

"Sales" Resistance

In view of these drawbacks, it is easy to imagine what a strenuous time the electric companies had to attract customers. In order to get any contracts at all, they had to sell prospective users on the idea of attaching some bare wires to wooden knobs or anything else that seemed a good substitute, and festooning them about the place to supply a few lights, which were usually fastened with tape or with string to the gas fixtures! The lamps burned out rapidly, and at best produced a sickly yellow light of low quality because no one had learned how to increase the incandescence of the filament—without drastically shortening the all-too-brief useful life of the lamp.

I well remember an experience during this early period, when I answered a complaint about poor light: An extremely earnest maid opened the door of the customer's residence and led me to the pantry. There she lighted a candle and, holding it aloft, took me into the dining room, where she turned on the electric light, put the candle close to the light, and said with all seriousness: "Here's the light—can you see it?"

High Costs

The pioneering souls who did sign up had to pay well for their enthusiasm. In those days, one paid a dollar for an electric lamp that only remotely approached the highly-improved lamps of today that sell for a dime apiece. The monthly *minimum* service charge ranged from $2.50 to $6.25 in different sections of the city, compared with a minimum of seventy-five cents in this city now. The rate for Electricity was between five and seven times the present average residential rate. It is no wonder that only the wealthier homes even considered the use of Electricity!

Philadelphia's First Arc Lights

When we pause to examine the stumbling blocks usually placed in the path of epoch-making developments and what hurdles pioneers often are compelled to span to prove the worth of their new ideas, it is not surprising to find that the Philadelphia Select and Common Councils in 1881 opposed a suggestion by the city's *first electric light company*—The Brush Electric Light Company, by the way, which was incorporated March 31, 1881—to try electric arc lights for lighting Chestnut Street. The lukewarm interest and charges of excessive cost that followed gave little cause for optimism. Nevertheless, the electric company offered to make the demonstration without charge. Accordingly, an ordinance for one year was voted the company, which provided that "said lighting shall be done without any expense to the city, nor shall any liability be incurred by said city, either directly or indirectly."

Public Acceptance of New System

Everything finally being in readiness, the new arc lights were switched into circuit for the first time *on December 3, 1881*. Apparently, the reporter assigned to cover the incident did not regard the event very seriously, if we are to judge from the following drab item that appeared in the morning paper:

"At half past one o'clock this morning, Chestnut Street for the first time was lighted by Electricity. There are forty-nine lamps extending from the Delaware to the Schuylkill River, one at each crossing, and one in the middle of the square."

Notwithstanding the reporter's lack of enthusiasm, the new system won public favor, and within six months the city's *two* electric companies of that period were authorized to expand their facilities. The city fathers apparently slavishly adhered to the maxim that "competition is the life of trade" and provided for rivalry between these companies from the very outset, since the ordinances granted them permitted each company to run electrical circuits on identical thoroughfares!

Expansion of Electric Service in Phila.

During the 80's and 90's, franchises were granted to dozens of companies who formed to supply electric service in the Philadelphia area; and many existing companies were authorized to extend the limits of their territory. It was a period of quick expansion of a new industry, and by 1895 electric service was available in virtually every part of the city.

The territories of some of these utilities overlapped, it is true, and a few of the companies operated from dusk to dawn only, but the mere fact that so many of these early utility organizations grew and prospered indicated that they possessed elemental as well as positive virtues.

Chaotic Conditions

The rapidity with which the whole Philadelphia area was blanketed in this initial introduction of electric service, with virtually no regard for service standards as we know them today, produced some rather confusing situations. There was *direct current* at 110, 220, and 600 volts; single-phase, two-phase, and three-phase *alternating current* at frequencies of 60 and 133 cycles. If a customer moved from one locality to another, in fact if he moved from one side of the street to the other in some sections of the city, he might discover that whereas his lamps would burn, it was impossible to operate any motor-driven apparatus.

Consolidation of Properties

This chaotic state of affairs turned out to be a blessing in disguise, for it set the scene for the integration of certain Philadelphia utilities, a step that ultimately resulted in bringing into *one consolidated system*—the Philadelphia Electric Company—approximately *four hundred* different companies in the Philadelphia area. The nine generating stations included in the earliest combination of companies had a total capacity of 22,000 kw, and were called upon to supply a peak load of 19,000 kw. This was the beginning of Philadelphia's metropolitan system!

Edison Company

I only wish time permitted more than passing comment on the kaleidoscopic changes, and thrilling—and at times, hair-raising—experiences in which it has been my privilege to participate since entering the employ of the original *Edison Electric Light Company*, in 1898. This company operated independently until 1899, when it was included in the consolidated program mentioned above.

The Edison generating station, which was erected under the personal supervision of Thomas A. Edison, stood at 908 Sansom Street, Philadelphia. Its generating equipment—boilers, dynamos, and engines—has long since passed out of existence. With the elimination of direct current service, which work was completed in 1935, the old-fashioned but historic landmark was of no further use and in 1942 it was demolished—its mil-

lion or more pounds of steel and iron contributing to the sorely-needed demands of the Second World War. When it was started in 1888 it was to be the "immense 8-story plant for the permanent supply of light and power in Philadelphia." It was the city's first successful electric plant, as well as *the first building in the country* constructed specifically as a generating station.

As originally conceived, the "Edison Station" was to consist of twenty 250-hp engines, each belt-connected to a pair of Edison bi-polar dynamos, making a total installation of 40 dynamos. It was to have a capacity of 60,000 sixteen-candle power lamps. Before this installation was completed, the design was increased to 150,000 lamps.

Comparison of Edison Jumbos With Modern Generator

It is interesting to compare the first Edison Station *dynamo,* described at the time as a "perfect monstrosity" and "the largest and most powerful in the world," with a single present-day generator. One of the original Edison bi-polar *"Jumbos"* weighed eighteen tons. In the Philadelphia Electric Company's Richmond Station, *one unit* now in operation weighs 1100 tons! The belt on one of the early dynamos traveled at what was then described as "the marvelous rate of one mile a minute," while the blade-tip of a modern turbine moves with the speed of sound, or in excess of *a thousand feet a second.*

Whereas twenty "engines" were required to produce 5000 hp in the Edison Station's earlier days, one of our present turbines produces 220,000 hp, which is enough Electricity to care for the needs of a city of 500,000 people!

With the rapid growth of load, the equipment used in the Edison Station soon completely filled the building. The problem facing management then was whether to build another Edison plant or to take the then-regarded radical step of adopting the alternating current system of generation and transmission.

A.C. Station at 26th and Callowhill

This system could produce energy at a more convenient location than the center of the city and transmit it to conversion equipment at any selected distribution center, at appreciably higher voltages. A new alternating-current station at 26th and Callowhill, in Philadelphia, was the result. The old stack and boiler room still stand on the banks of the Schuylkill River and supply *steam* to Philadelphia's Museum of Art. The initial installation at this new station consisted of one 1000-kw Corliss engine-driven unit, later increased to four units, the full capacity of the station. The Electricity produced was transmitted through 2400-volt cables to a 60-cycle rotary converter at the Edison Station, where it was changed to direct current and fed into the Edison System. This was an historic step, because it not only established the principle of alternating current production and conversion, but it was the first large capacity attempt to utilize a *60-cycle* converter, which received its energy from a generating source supplied by a reciprocating engine.

Inadequate Switching Equipment

The switching equipment of those days was sorely inadequate, and our means of controlling this rather elaborate system were crude. The result was what one would expect. After a short but terrifying experience of a little over a year, the conversion equipment with all its control apparatus *blew up* in one of the biggest pyrotechnic displays I have ever witnessed. When the noise and the flying parts of commutators, brushes, and windings had settled down, and the operators had come out from behind columns and anything substantial that could protect them from the flying missiles, we again set about the normal procedure of running the plant *minus* this equipment.

Schuylkill Station

Nothing daunted, we had hardly cleared the wreckage when orders were issued for *four more* of these units. At about the same time, the then-regarded gigantic *central station* at Schuylkill was started. The original plans called for one 2000-kw, direct-connected, engine-driven set; and one 5000-kw, tandem compound, horizontal and vertical engine and flywheel generator, *the largest* of its kind ever produced. The ultimate plans of this station called for the then almost fantastic capacity of 100,000 kw. An installation of 20 of these 5000-kw units would extend from the Schuylkill River to Grays Ferry Road, in Philadelphia, a distance of more than a half mile. I could recite at great length the problems involved in keeping these two original units in parallel operation, but suffice it to say that the "big elephant," as it was nicknamed, proved to be the most cantankerous piece of equipment ever developed by an intelligent body of Engineering designers.

Steam Turbines

At just about this time, there emerged the first great advance in the art of producing Electricity—*the steam turbine!* And again, Philadelphia Electric Company was one of the first to try this new type of generating unit. The claims of the manufacturer were doubted by many but nevertheless we ordered two *500-kw* units, installing one in Tacony Station, and the other in our Chester Station. Looking back on the location of these two units, and considering all of the exasperating experiences we had keeping them in operation, I sometimes think that they were placed at these remote edges of the territory in order that the "headaches" resulting from the coddling and humoring needed to keep these contraptions harnessed to the system would not break the morale of the whole operating organization!

About the time these infant prodigies had taxed the engineers and operators to the limit of human endurance, there emerged a greatly enlarged and vastly improved steam turbine of *5000 kw* capacity. It was so much better that we felt justified in installing one in the central part of the system, at Schuylkill Station. Our hopes were short-lived, however, because the installation of the new unit brought on a multiplicity of new troubles.

No sooner had we finished the job of installing this newcomer than we awoke to a realization that the much advertised 5000-kw flywheel type of unit—the "big elephant"—just would not operate in parallel with its insignificant appearing teammate, which looked like a midget in comparison with the giant of steel and copper that towered above it. Like a stubborn mule, this huge engine-driven unit balked at every attempt to *harness it* to anything. The ultimate solution of the problem proved quite simple. The great, cumbersome unit on which the industry had so confidently pinned its faith ignominiously ended its short but hectic career in the scrap heap.

Need for Control Equipment

The gradual adoption of alternating current, as standard, provided a great opportunity to locate large power plants at water sources, where maximum economy could be obtained. Alternating current could be transmitted at high voltages, and the problem then became one of devising suitable equipment for controlling the rapidly-increasing concentrations of power. That was a period dur-

ing which the ingenuity of our Engineers was strained to the utmost, because our switching equipment utterly failed to keep pace with the rapid increase in generating capacity. In the early days of alternating current, we considered ourselves fortunate to be able to open safely concentrations of power of 100,000 kw at voltages not in excess of 13,200. Today, our control equipment can open with absolute safety concentrations of power of from three to four million kilowatts, with pressures up to at least 300,000 volts. *These achievements crown a most spectacular period in the history of the electric industry,* into which is crowded all the refinements dealing with the installation of transmission facilities, both underground and overhead.

Transmission

During this development period, great changes occurred in Philadelphia. The density of the areas supplied *grew to undreamed proportions,* and we were faced with the weighty problem of maintaining an adequate generating capacity to meet the development of utilization equipment, particularly in the commercial and domestic fields. Transmission capacity increased with the increase in voltage. Today, the Philadelphia area is interconnected with great 220,000-volt overhead transmission busses, and miles of underground 66,000-volt cables, which transmit energy at low losses. Some of these underground cables are capable of transmitting 100,000 kilovolt-amperes. This is a far cry from the modest voltage of 2400, which we used to transmit Electricity from Callowhill to 908 Sansom Street, a distance of a couple of miles, at the turn of the Century.

Generation

In the generating branch of the electric business we have progressed from the modest 250-hp engine-driven Edison bi-polar *"Jumbo"* dynamos to individual steam turbines capable of a normal and continuous output of *165,000 kw.*

Coal Rate

With this increase in size have come numerous refinements and advances, both in reliability and efficiency, in the art of producing Electricity. As a measure of these improvements, consider the fact that the coal consumption of the first Edison plant was about *six pounds per kilowatthour.* Today, the entire system of the Philadelphia Electric Company uses an all-year average of *one pound of coal* per kilowatthour produced.

Line Losses

Likewise, line losses of Electricity, from generation of the energy to delivery to customers, have also steadily decreased concurrently with the advances in production efficiency. During the past 30 years, these losses in the Philadelphia Electric Company System, for instance, have dropped from about 22 per cent to slightly more than 7 per cent, measured on an annual basis. This improvement has been made despite the vast growth of the load, and the sprawling network of transmission and distribution lines which has been necessary to supply that demand.

Railroad Electrification

No story of the electrical development in Philadelphia would be complete without some mention of the part taken by the Philadelphia Electric Company in the development of what today is *the largest railroad electrification load* in the world.

The foresight and courage of the Pennsylvania Railroad, back in 1912, when they were planning electrification of their lines in the Philadelphia area, resulted in their rejecting the use of direct current produced in their own plants, a method then in limited use by one or two other railroads, and instead, taking two radically different steps—*first:* they decided on single phase, 11,000-volt alternating current, and—*second:* they elected to buy *central station service* instead of making the power themselves. The wisdom of this move, from the standpoint of both economy and dependability, has certainly been justified in the ensuing years.

Supplying the current, however, involved almost insurmountable difficulties for the Philadelphia Electric Company (and parenthetically, I am not sure but what our good friends in the Pennsylvania Railroad were also heavily burdened with their own particular brand of "headaches"). *Single-phase* energy in large amounts just could not be produced from standard *three-phase* generators, without burning things up. Some means had to be devised—and quickly—to permit the automatic spread of the single-phase load equally on all three phases.

Repeated trials were made of many types of equipment and methods, but all ended in discouraging failure. Finally, just when we were at our wits' end, the president of the General Electric Company asked us to meet him and his experts in Schenectady, as they had something quite interesting to show us. We accepted his invitation. Upon our arrival, we were presented a brief plan of a theoretical machine, but the big question was, "Will the machine work?" Someone suggested that Dr. Steinmetz, the General Electric's mathematical and electrical wizard, be called in. It was discovered that this gentleman was at home—(he hated the factory anyway)—so for an hour we sat patiently awaiting the Doctor's arrival. After listening to a description of the machine proposed, Dr. Steinmetz asked the inventor for the fundamental equation. Thereupon he wrote down the mathematical formula involved and began making line after line of calculus computations.

He filled one page—and half of another. Then, with the characteristic stogie stuck in the corner of his mouth, he paused for a moment or so, looked up at us, and, with absolute assurance in his voice, said, "Yes, it will work." Two great, complicated *phase-balancers* were the result. They were shipped to Philadelphia without even testing, for time was running out. Eventually they were installed in Schuylkill Station and, believe it or not, they operated under the most severe service conditions without the slightest difficulty!

This striking example of how our first great railroad electrification problem was solved is typical of the way many other baffling questions were worked out. These solutions not only satisfied problems of immediate concern to customers and company alike, but they actually formed the basis for new advances in the art of generating and distributing Electricity. Many of these accomplishments are accepted today as a matter of course in the routine supply of electric service, yet I know that in every case they were developments of outstanding merit, made possible only because eager mathematical brains, sound Engineering knowledge, and ingenuity, plus a liberal dose of common sense, combined to win the day!

Milestones

From a technical standpoint, I have given you only a quick glance at a few high spots—all, however, milestones in the progress which has been made since the first development of electric supply in this area. The years that have elapsed since the opening day of the first *central station supply* of Electricity in Philadelphia hold a human story of gripping experiences and notable contributions of an

army of men who, over the years, have been imbued with an urge to take what they found and make of it something better—something that would take them closer, with each forward step, to what seemed a humanly perfect goal.

New Vistas

Until the practical and economic use of Atomic Energy becomes an actuality, it would appear that engineering and technical developments may tend to flatten out. Perhaps some of the fun and part of the romance have been taken out of the job—as well as a great many of the "headaches"—but I doubt it! Nevertheless, I cannot help but believe there lies ahead an era of greatly expanded public service—another milestone, if you wish—an era in which factories, shops, and homes will utilize Electricity to the point where all will be completely dependent upon it.

Higher Service Standards

When this day arrives—and I am sure it will—the least important thing about the use of Electricity will be *the cost.* Even today electric rates have reached the point where, except for very special cases, they are no longer an important part of the family, the business, or the manufacturing budget; and as time goes on, the amount of the bill will, I am confident, be completely outweighed by such factors as reliability of supply, the maintenance of high service standards, the adaptability of the utility organizations to changing customer demands, and the sincerity of approach in all of these respects. Thus, the continued progress of utilities will depend on service rendered.

Conclusion

Experts say the future has in store for us better health, greater comforts, new luxuries, and more pleasures—through Electricity. It is the great importance of these very things to all of us that spotlights the indispensable position Electricity will hold in the years ahead.

The Philadelphia Electric Company has grown up in this territory! It has lived through the expanding years of this area's economic and social life. Its employees, in large part, are from the "grass roots" of this community. It has learned, I feel certain, how to satisfy the wants of its friends and neighbors—*its customers*—and it is keenly alive to its responsibilities and to its obligations—now and in the future.

We look forward with confidence to brighter days ahead, eager to meet *the challenge of a public demand* for electric service as nearly perfect as it is humanly possible to provide.

The Electric Light and Power Industry in 1945

(*Continued from page 4*)

fuels which, at the present average prices, represents an offset of some $35,000,000 in the utilities fuel bill in 1945.

Granting normal precipitation during the winter, the industry should start 1946 with the best water conditions on record and should be able to operate hydroelectric plants at high levels and put highest-cost steam generating plants back on a standby basis. Under these conditions, a further decline in the consumption of coal may be expected for next year.

Utilities Organizing Their Greatest Sales Program

During the war, new processes and equipment calling for greater use of electricity have been developed that presage a growth in all branches of the business in the postwar period. In the industrial field, in addition to the greater use of electricity for lighting, electrochemical and electro-metallurgical purposes, there were numerous heat applications, improving accuracy and speed, that were brought to perfection. In office and home the effort to raise lighting standards and to save time and drudgery in household tasks represents years of future work in education and development. On the farm, even after electric service is made available, there remains a tremendous job of demonstrating to farmers the use of the appropriate apparatus and methods to make electric service useful and economical in carrying on their farming operations.

The constantly broadening front of electric utilization and the increasing number and complexity of the tools with which to handle it, clearly demonstrates that the electric utilities face the greatest commercial sales program of their history. The war caused substantial decreases in personnel in the sales departments of the utilities, so that the training of new recruits and refreshing of older men calls for further organized effort in sales training. This the utilities are meeting with a well developed series of visual training courses that have been prepared for this anticipated need.

Profitable Application of Atomic Energy Still Far in the Future

The vision of the possible use of the nuclear energy in the atom as a source of electric power supply was opened up by the achievement of the atomic bomb. The information presented to the public since August by those who developed the bomb indicates, however, that, even if the physical, chemical and engineering requirements had been worked out for the safely controlled release of this energy, the cost of the special plant, and of the nuclear material required for the purpose, would be far above the cost (only one-sixth of the total cost of rendering utility service) now currently shown for fuel in utility power stations with the use of coal, oil or natural gas.

89% of Dealers to Install Complete Kitchens

COMPLETE kitchen installations will be handled by 89% of electrical appliance dealers, according to results of a survey of 12,000 dealers made by Edison General Electric Appliance Co. The survey, covering refrigerator display, attitude on trade-ins, home freezers and type of store, is intended to secure information on postwar plans.

Results tabulated up to Dec. 15 indicate that almost 90% of those answering will install complete kitchens, and about one-half will display complete kitchens in their showrooms. According to Floyd M. Slasor, manager, refrigerator sales division, this change in merchandising techniques is the greatest single development in postwar refrigeration selling. Previously, dealers sold refrigerators mainly from straight model selection displays, he said.

Almost 30 per cent of the dealers think that trade-ins will figure in less than 10 per cent of refrigerator sales in the immediate future, although another question on prewar experience indicated that 30 per cent of prewar sales included trade-ins.

Changes in Motor Starting Rules Recommended to Facilitate Domestic Air Conditioner Installations

A Report on Work of the Joint Subcommittee on Domestic Air Conditioning

By J. W. Anderson
Chairman, EEI Group

Presented at Meeting of Transmission & Distribution Committee, EEI, Oct. 15-16, 1945 – Cleveland, Ohio – also discussed at Electrical Equipment Committee, EEI, Meeting, Oct. 7, 1945.

Editor's Note: The proposal presented in the following report was discussed at meetings of the EEI Transmission and Distribution and the EEI Electrical Equipment Committees, and the recommendations of the Joint Committee were unanimously endorsed. The proposal has subsequently been reviewed by the EEI Codes and Standards Committee.

The A.C.R.M.A. has acted favorably on the joint committee proposal and has recommended to its members that room air conditioners with single phase motors having locked rotor currents in excess of 40 amperes at 115 volts should be installed for 230 volts for residential applications. In so doing it has taken a forward looking step in the solution of a difficult problem.

On the part of the Edison Electric Institute it has been recommended to member companies that motor starting current rules be amended to permit 40 ampere locked rotor current for infrequently started 115 volt single phase motors. It was also recommended that member companies advise their local electrical contractors associations and electrical appliance dealers associations of such modified regulations and urge upon these associations the installation of 230 volts single phase motors for devices which cannot meet this liberalized requirement.

At a joint meeting of the Transmission & Distribution Committees, Edison Electric Institute and Pennsylvania Electric Association, in Pittsburgh, February 15, 1945, a report was presented outlining the tremendous volume of post-war sales of domestic air conditioners and home freeze units which the refrigeration industry was preparing to foster, and pointing out that the motors which were intended for use with room coolers would be rated at 115 volts with actual inputs of more than 1200 watts and starting currents approaching 60 amperes. Some of the power system distribution problems resulting from widespread use of these devices were discussed and the recommendation made that, since this was a national problem, the Transmission & Distribution Committee, EEI, sponsor a joint study of this matter with the Air Conditioning and Refrigerating Machinery Association, Inc., with a view toward minimizing and controlling adverse effects of this load to the mutual benefit of both industries. The EEI Committee agreed to this proposal and a joint EEI-ACRMA subcommittee was appointed for the purpose.

This report will be divided into parts: (1) further discussion of the electrical characteristics of residential air conditioners and their effects on power distribution systems, and (2), discussion of the work of the joint subcommittee, concluding with a recommendation for action by the Transmission & Distribution Committee at this time.

ELECTRICAL CHARACTERISTICS OF DOMESTIC AIR CONDITIONERS

1. Room Coolers

In the original report of this Committee in February, starting and running demands for typical post-war room coolers were presented. To provide a more complete picture, these requirements are repeated in Table I along with other information just recently made available. In the progress report presented in Cincinnati on May 15, the effect of starting requirements and resultant voltage dips on typical radial transformer-secondary combinations were discussed in greater detail. It appeared from these studies that voltage dips of 20 to 30 or 40 volts could be expected with the 57-ampere starting current listed, whereas, with increasing numbers of these devices appearing on power system secondaries, such dips should be limited to the order of 4 volts if excessive flicker complaints were to be avoided.

With dips of the magnitude indicated, and particularly in view of the low revenue available from these devices to jus-

TABLE I—ELECTRICAL REQUIREMENTS OF DOMESTIC AIR CONDITIONERS

	Starting			Running			
	Volts	Amp.	P.F.	Amp.	V-A	Watts	P.F.
Room Coolers							
Manufacturer A							
1/2 hp.	115	36	(y)	10.1	1161	875	75%
3/4 "	115	50	(y)	14.5	1667	1250	75%
Manufacturer B							
1/2 ton	115	35	81%	8.2	943	785	83.5%
3/4 "	115	57	72%	12.9	1483	1220	82.5%
Central Plant							
Manufacturer A							
2 hp.	230	40.8	52.1%	11.35	2750	2090	75.9%
3 "	230	60.6	57.9%	18.85	4340	3420	78.8%
5 "	230	101.3	52.5%	30.7	7060	5505	77.9%
Manufacturer C							
3 hp.	230	70	80%	17.5	4030	3734	92.5%
5 "	230	95	80%	31.0	7120	6360	89.4%

(y) Not available; capacitor-start motors

Permissible Starting Current for 230-volt single phase motors	Philadelphia	Pittsburgh	Cincinnati
2 hp.	40 amp.	50 amp	40 amp.
3 "	60 "	70 "	60 "
5 "	100 "	110 "	100 "

tify economically the increase in size or number of transformers and/or the increase in secondary wire size, consideration naturally turns to the use of autotransformers and banked line transformers as means of providing better voltage regulation. Table II and Fig. 1 summarize the results of a study of the improvements to be attained by these methods. Again the 115-volt 57-ampere starting current motor listed by Manufacturer B is used as the basis of the study. Curve A shows the dip resulting on a radial No. 4 secondary supplied by a 10 kv-a transformer; curve J shows the very much smaller dip on the same transformer and secondary with an equivalent motor operating at 230 volts. Curves B to I inclusive show the improvement obtained by autotransformers, banked line transformers, and combinations of the two. Certain of the curves also recognize increased transformer and secondary wire size as well as closer transformer spacing. For full understanding, these curves require a more leisurely comparison than can be given here.

It is desired to emphasize that these curves are intended to show relative voltage dips only for the specific conditions listed, and no recommendation is made for the adoption of any of these methods. All of them require certain protection and installation techniques and their advantages and disadvantages must be evaluated by any individual company considering their use.

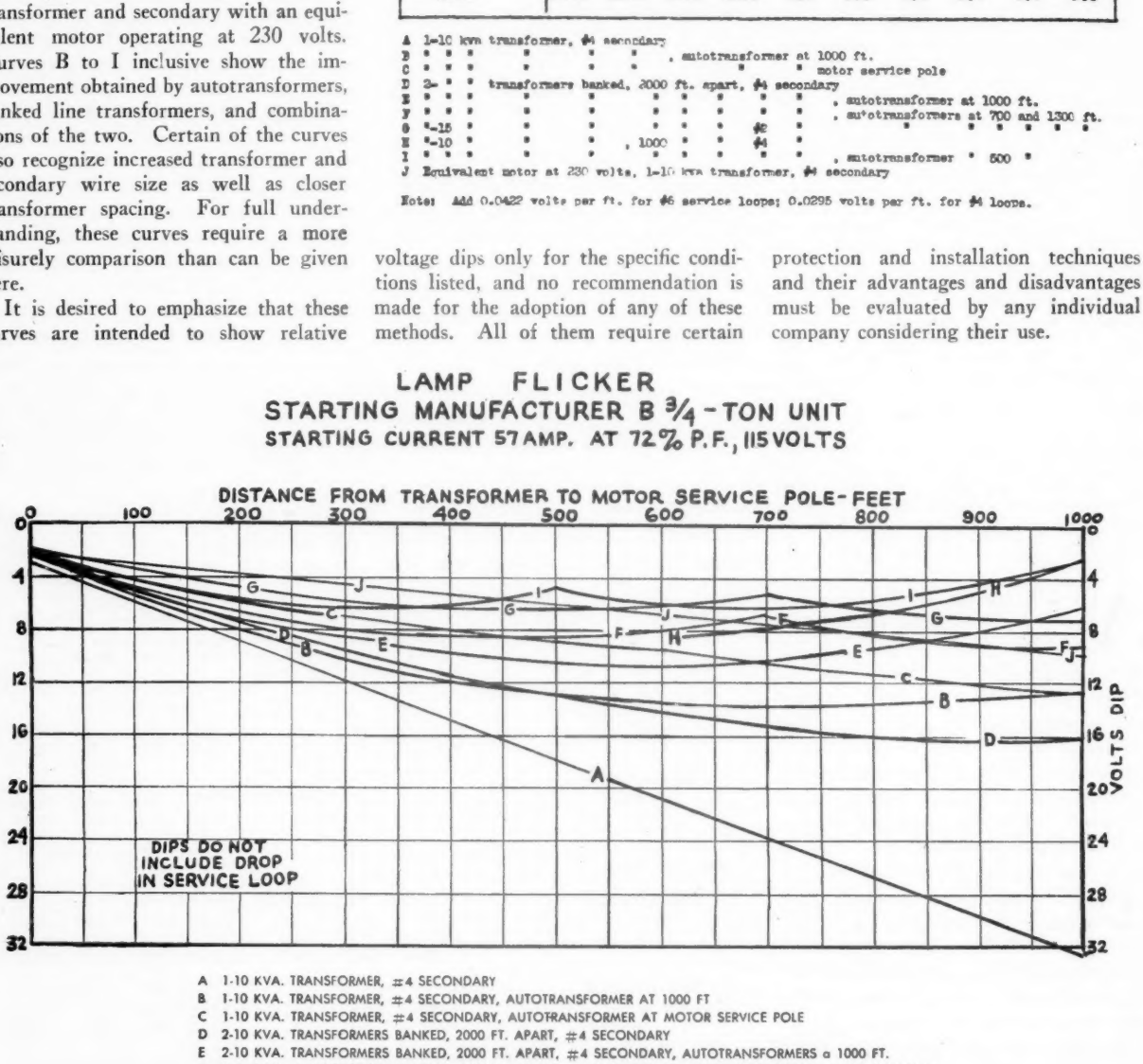
TABLE II—SUMMARY OF LAMP FLICKER
Manufacturer B ¾ Ton Unit

STARTING CURRENT 57 AMP. AT 72% P.F., 115 VOLTS

Distance - Transformer to motor service pole - feet	VOLTS DIP									
	A	B	C	D	E	F	G	H	I	J
0	3.1	3.1	3.1	3.0	2.8	2.8	1.9	2.7	2.7	2.3
100										
200				7.8	7.3	6.9	4.9	6.8	5.9	
300		10.1	7.1						6.4	
400				11.6	9.9	8.7	6.3	8.7	6.1	
500	17.8	12.8	8.9			8.6	6.4	9.1	5.0	6.1
600		13.6	9.6	14.3	10.8			8.7	6.1	
700		14.0	10.5			7.0	5.5		6.4	
800		13.8	11.3	15.9	9.6	8.5	6.6	6.8	5.9	
900										
1000	32.6	12.8	12.8	16.3	6.4	9.3	7.2	2.7	2.7	9.9

A 1-10 kva transformer, #4 secondary
B " " " " , autotransformer at 1000 ft.
C " " " " " motor service pole
D 2- " " transformers banked, 2000 ft. apart, #4 secondary
E " " " " " " " , autotransformer at 1000 ft.
F " " " " " " " , autotransformers at 700 and 1300 ft.
G 2-15 " " " " " #2 " " " " " "
H 2-10 " " , 1000 " " #4 " " " " "
I " " " " " " " , autotransformer " 500 "
J Equivalent motor at 230 volts, 1-10 kva transformer, #4 secondary

Note: Add 0.0422 volts per ft. for #6 service loops; 0.0295 volts per ft. for #4 loops.



A 1-10 KVA. TRANSFORMER, #4 SECONDARY
B 1-10 KVA. TRANSFORMER, #4 SECONDARY, AUTOTRANSFORMER AT 1000 FT
C 1-10 KVA. TRANSFORMER, #4 SECONDARY, AUTOTRANSFORMER AT MOTOR SERVICE POLE
D 2-10 KVA. TRANSFORMERS BANKED, 2000 FT. APART, #4 SECONDARY
E 2-10 KVA. TRANSFORMERS BANKED, 2000 FT. APART, #4 SECONDARY, AUTOTRANSFORMERS a 1000 FT.
F 2-10 KVA. TRANSFORMERS BANKED, 2000 FT. APART, #4 SECONDARY, AUTOTRANSFORMERS AT 700 & 1300 FT.
G 2-15 KVA. TRANSFORMERS BANKED, 2000 FT. APART, #2 SECONDARY, AUTOTRANSFORMERS AT 700 & 1300 FT.
H 2-10 KVA. TRANSFORMERS BANKED, 1000 FT. APART, #4 SECONDARY
I 2-10 KVA. TRANSFORMERS BANKED, 1000 FT APART, #4 SECONDARY, AUTOTRANSFORMER AT 500 FT.
J EQUIVALENT MOTOR AT 230 VOLTS, 1-10 KVA. TRANSFORMER, #4 SECONDARY

FIG. 1

Since the last meeting of this Committee, some consideration has been given to voltages under normal running conditions and the probable number of room coolers that might be supplied from a given transformer without overloading it.

With respect to running voltages, some computations recently made indicate that with ¾ hp, 115-volt installations on radial secondaries, 350 to 400 feet is about the limit for No. 4 secondary and 500 to 600 feet for No. 2 secondary, assuming favorable balance and distribution of both general and air conditioning loads. Thus, with 125-foot spans, one air conditioner per span, and the transformer located in the center of the secondary, it appears that the maximum number of units that could be supplied with satisfactory normal voltage would be about six with No. 4 secondary and about eight to ten with No. 2 secondary.

These limits dovetail reasonably well with results obtained from a consideration of the margin in capacity available in distribution transformers for the supply of summer loads. From this point of view, 10 to 15 ¾ hp units will be about all that could be added except on the larger ratings. The number of such units that can be made of course depends on the distribution transformer loading policy of the individual company and the relationship between summer and winter peak loads on the transformer. For example, assuming a 15 kv-a transformer with a winter peak of 130 per cent of rating, a summer load of 80 per cent of the winter peak, and a permissible summer load on the transformer of 125 per cent of nameplate, only two ¾ hp units with an input of 1.5 kv-a each can be added. If, however, the winter load is only 90 per cent of the transformer rating and the summer load is only 60 per cent of the winter load, then the 125 per cent permissible summer loading permits the addition of seven ¾ hp room coolers. There will, of course, be all sorts of margins available in the transformer. Also, many of the room coolers to be sold will be the nominal ½ hp units with starting currents of 35 to 40 amperes and a normal running demand of about 1.0 kv-a. The smaller starting flicker from these units will be offset by the greater number that can be supplied from a given secondary.

Obviously it does no good to increase the size of the transformer where voltage drop in the secondary also imposes a limitation. Thus, if these units are to operate at 115 volts, closer spacing of transformers, heavier secondaries, autotransformers, banked line transformers and combinations of these methods may be required for normal voltage functions as well as alleviating the starting flicker problem. The action to be recommended to this Committee later in this report should cause a very substantial number of these larger units to be installed for 230-volt operation and thereby minimize these distribution problems.

2. Domestic Central Plant Installations

The initial work of the Subcommittee was confined to room coolers, since these devices were evidently to be the subject of immediate post-war volume sales pressure and therefore constituted its most pressing problem. However, since the Cincinnati meeting, data on the electrical characteristics of domestic central plant installations have been received from two manufacturers. These data are summarized in Table I. It will be noted that 2, 3, and 5 hp 230-volt single phase motors are involved, and that their starting currents conform reasonably well with starting currents permitted under the regulations of the three utilities listed.

Lamp flicker computations have been made on the starting of these motors and the results are summarized in Fig. 2. It appears that lamp flicker may be as objectionable with these units as with room coolers. Further, central plant jobs will in general be automatically controlled, thus increasing the frequency of starting and the probability of complaints. However, consideration of capacity available in a given transformer and probable normal running voltage regulation, indicates that relatively few

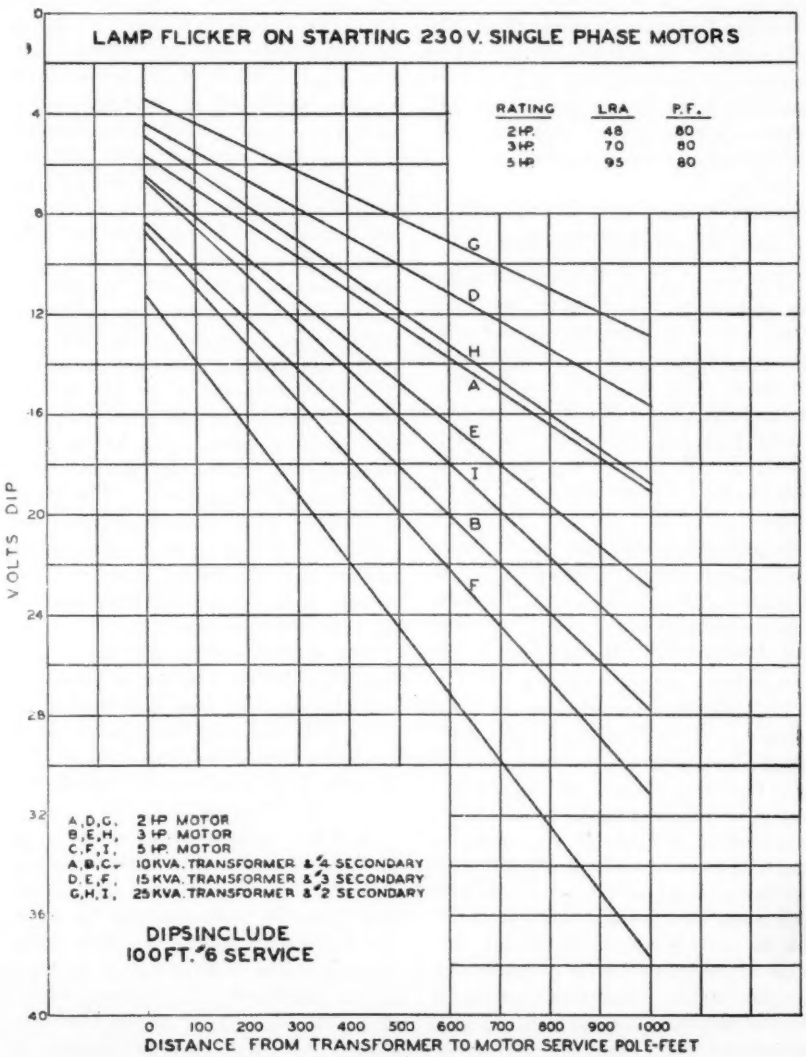


FIG. 2

(probably one to four under usual conditions) such installations can be supplied from a given radial transformer-secondary combination. Thus the probability of complaints as a result of frequent starting will be at least partially offset by the relatively small number of units contributing to the total number of flickers affecting all customers on the secondary. Thus two central plant installations starting 15 times over the daily air conditioning period will produce no more flickers than ten room coolers starting only three times daily.

No conclusions have been reached on any of these matters. It appears, however, that larger transformers, closer spacing of transformers, larger secondaries, and banked transformers are all possibilities that may have to be considered both for the larger sizes of room coolers with single phase 115-volt motors and for the larger sizes of central plant installations with single phase 230-volt motors. In addition, the autotransformer is a possibility for 115-volt motors and the use of polyphase motors will have to be considered for the larger integral horsepower installations.

ACTIVITIES OF JOINT EEI-ACRMA SUBCOMMITTEE

The joint EEI-ACRMA Subcommittee was organized in May and June, 1945, with the following membership:

Representing EEI: C. E. Bathe, Oklahoma Gas & Electric Co., Oklahoma City, Okla.; W. R. Weise, Cincinnati Gas & Electric Co., Cincinnati, Ohio; J. W. Anderson, Philadelphia Electric Co., Philadelphia, Pa., Chairman.

Representing ACRMA: B. E. James, York Corporation, York, Pa.; A. B. Newton, Air-temp Division, Chrysler Corp., Dayton, Ohio; F. H. Faust, General Electric Co., Bloomfield, N. J., Chairman.

This joint subcommittee met in Philadelphia on July 5, 1945. At this meeting, EEI representatives emphasized the fact that the electric utility industry was in no way attempting to retard the development and use of air conditioning; rather it was the desire to foster the development of air conditioning in such a way that manufacturers would be able to provide equipment of such electrical characteristics that customer satisfaction would be assured insofar as electric service is concerned. It was pointed out that, based on information available to the EEI group, it appeared that present development trends, at least insofar as room coolers are concerned, indicated that such satisfaction would not be realized as saturation of the use of such equipment develops.

The problems of the electric utility in supplying the proposed larger sizes of 115-volt room coolers from residential secondary circuits were presented along the lines already discussed in this Committee, and will not be repeated here. After some discussion, it was agreed that utilities are not in position generally to supply starting currents of 50 to 60 amperes at 115 volts from residential circuits. In considering various possible means of reducing starting requirements, ACRMA representatives felt that on the basis of their experience, a motor delivering 200 to 250 per cent torque or more at 90 per cent voltage was required to care for the situation where users shut the equipment down and immediately restart it. Unloaders were felt not to be particularly beneficial, inasmuch as tests have indicated only two or three amperes difference in starting current with compressor loaded and unloaded. The repulsion-induction motor was discussed and is considered to be generally unusable because of its size and weight and because of the possibility of radio interference, as well as the fact that many post-war units will be hermetically sealed, thus precluding access for proper maintenance. A member of the ACRMA group mentioned a dual-capacitor motor that had been tested in the 1½ hp 230-volt size and which had a full load current of 20 amperes and a locked rotor current of 28 amperes developing a starting torque of 40 per cent. The use of this motor with an unloader adds an extra $11 or $12 to the manufacturing cost and probably two or three times this amount to the retail price, thus impeding the sale of the equipment.

The possibility of lamp flicker at high frequency due to compressor pulsations was also discussed. ACRMA representatives felt that with the general use of 2-cylinder compressors operating at 1750 rpm, the high WR^2 would preclude the probability of such flicker.

ACRMA representatives inquired as to the probability of utilities enforcing their motor starting current rules, which vary from 20 to 40 amperes for infrequently started units in large cities throughout the country. EEI representatives could make no guarantee of enforcement of rules, or of the ability of utilities to police the installation of equipment which violated the rules.

In summarizing the discussion, it was generally agreed the ¾ hp motors and larger are not practicable at 115 volts because of high starting current requirements. Two proposals were then made, as follows:

1. That EEI recommend to its member companies the general adoption of 40 amperes locked rotor as the permissible starting current for infrequently started 115-volt single phase motors. This would permit the use of 115-volt motors up to and including ½ hp.

2. That ACRMA recommend to its member companies the general adoption of 230 volts for all equipment having more than 40 amperes locked rotor at 115 volts. This would apply both as a manufacturing standard and an installation standard.

No action was taken on these proposals at the July 5 meeting. However, they have since been given further consideration by each group in independent actions.

At a meeting of the Engineering Committee, Room Air Conditioner Section, ACRMA, in New York on August 22, 1945, a report on the July 5 joint subcommittee meeting was presented. After some discussion, the Engineering Committee referred the matter to its parent group, the Room Air Conditioner Section, where at a meeting in New York on October 3, 1945, it was thoroughly discussed. Following this meeting, the Chairman of the EEI group received the following communication from F. H. Faust, Chairman of the ACRMA group:

> At a meeting of the Room Air Conditioner Section of the Air Conditioning & Refrigerating Machinery Association in New York on October 3, I presented a report of our joint committee activities as shown in the minutes of our meeting of July 5.
>
> I explained that a survey of utility regulations for principal cities in the United States indicates that motors are restricted for residential service at 115 volts to a maximum of 20 to 40 amperes locked rotor current with an average limit of 30 amperes or less, whereas the two sizes of room air conditioners sold in principal volume have locked rotor currents ranging from 38 to 64 amperes.
>
> The Room Air Conditioner Section was sympathetic with the problems facing the electric utility companies in applying the larger sizes of room air conditioners on residential circuits. A resolution was passed to recommend to their members that room air conditioners which have condensing unit motors with locked rotor current in excess of 40 amperes at 115 volt, single phase should be installed for 230 volt power supply for residential application. They further recommended that the manufacturers pass this recommendation on to their distributors and dealers.
>
> The above resolution was approved contingent upon the Edison Electric Institute recommending to its members that they

(*Continued on page* 32)

Summary of National Electrical Code Changes of Interest to Light and Power Industry

Based on actions of N.F.P.A. Electrical Committee Meeting Chicago, October 8 to 12, 1945.

FOLLOWING the five days of concentrated work of the Electrical Committee in Chicago last October, the 1940 National Electrical Code will be re-edited throughout to include all agreed upon changes. The new Code will probably be known as the 1946 edition and become effective late that year.

Changes in the Code

Articles 210 and 220

Branch circuits for general use supplying lighting and appliance outlets were re-rated to correspond to new nominal current-carrying capacity of conductors and over current protection devices. The new ratings will be: 15, 20, 30, and 50 amperes. There will be some liberalization in the use of heavy duty appliances equipped with flexible cords on such branch circuits. Ref. New Sec. 2127.

A specific change was made to recognize supply voltages up to 300 volts above ground for lighting circuits in industrial establishments. This was specifically to apply to industrial types of fluorescent fixtures but would be applicable to mercury vapor and incandescent, using other than medium base sockets. Ref. New Sec. 2113.

The proposal to extend recognition of the common neutral in the Code to branch circuits was defeated but conversely, no rule for prohibition was included which will no doubt make it usable in rewiring with local approval. Ref. proposed New Sec. 2112. The multi-wire branch circuits from 3 or 4 wire services will of course continue to be recognized. Common Neutral may still be used for feeders.

New reduced demand factors for computing size of electric range feeders were approved, including a reduced size (70 per cent) neutral conductor. This results in an appreciable reduction in required size of conductors for more than one range larger than 10 kw. Present demand factors will also be continued which will permit the same size of conductor as used heretofore for smaller ranges. Ref. 2121al and 2203d.

A proposal from the floor to require a 3-pole polarized receptacle for laundry equipment in residences, so as to provide a means of grounding, was approved over the objection of the Light and Power Group and N.E.M.A. in spite of the fact that it was pointed out that the whole subject is being studied (See Art. 250) and such a rule was premature. It should also be noted that no corresponding rules were adopted requiring that a ground wire be run to the third pole of the receptacle, nor need washers and other laundry equipment be provided with 3-wire cords and plugs.

A new provision requires that fluorescent lamp loads are to be computed on the total amperage of fixtures and not on wattage of lamps alone. This is a step to obtaining use of high power factor ballasts.

Articles 230 and 710

Voltages up to and including 15 kv are recognized for services and industrial plant wiring when installed in conduit with accompanying fuses and metal enclosed switch gear suitable for the conditions of service and the voltage involved. This, in general, is an increase from the former limit of 7500 volts. Ref. 2387, 2389, 7112 and 7143.

Article 240

The so-called Type S tamper resisting fuse (now required but held in abeyance due to wartime interim amendment) was retained, with the Light and Power Group voting *no*, NEMA not voting. (Labor representatives with a number of others also voted *no*.) A proposal to require a 20 ampere Type S fuse holder in addition to the present 15 and 30 ampere was defeated. Ref. 2453.

Section 2409C which calls for a fuse in the grounded leg of unpolarized branch circuits was deleted.

A change was made requiring a trip coil for circuit breakers in each ungrounded conductor (2 on 3/3 wire previously permitted) to provide better protection. Ref. 2405.

Article 250

The grounding of range frames to the neutral conductor was specifically recognized. This is now the most common method of grounding, but heretofore was by special permission. Ref. Sec. 2559.

The general subject of protection from shock hazard of portable appliances (by grounding, insulation, isolation or otherwise) was referred to Article 250 Committee for special study and report at the next Committee meeting.

The minority report submitted by several members of Art. 250 committee, objecting to any use of the neutral conductor for grounding and to any supplementary grounds on the load side of service equipment, was withdrawn by its sponsors without consideration of the meeting.

Where a wiring system serves more than one building, additional neutral grounds in out buildings will be mandatory under certain conditions. See Section 2524.

A new provision requires that frames of electric ranges be grounded in all cases.

Article 300

A proposal sponsored by the Light and Power Group to extend the use of an uninsulated neutral (now permitted in services) to rewiring of feeders in raceways was defeated.

A move to delete the fine print note, favored by practically all groups interested in rural wiring, which encourages non-metallic wiring where city water pipe grounding is not available (as on farms) was defeated.

Article 310

General changes were made throughout the article to recognize new forms of insulated conductors for both general and specific uses. Thermoplastic insulation with 60°C rating, to be known as type T (or TW for the moisture resistant type) was approved for general use as well as for rewiring, in

sizes No. 14 to 4/0 in conduit and up to 2,000,000 circular mill for open work. Unmilled grainless rubber insulation with 60°C rating (latex) in size No. 14 to No. 8 was approved for general use. Standard type R rubber insulation previously rated 50°C will be improved, having quality at least equivalent to insulation heretofore identified as performance grade type RP, and will be rated 60°C. The type RH 75°C heat resistant rubber will be continued.

These changes in insulation make some changes in allowable current carrying capacities necessary. All the general use conductors will have ratings of 15, 20 and 30 amp for No. 14, No. 12, and No. 10 respectively. The larger sizes of new type R and other 60°C insulated conductors will have current-carrying capacities similar to the 60°C insulated conductors of the 1940 Code and the RH similar to the previous 75°C conductors.

The tables for number of conductors in conduit or tubing for old and new work will for all practical purposes remain as in the 1940 Code which will allow some reserve raceway capacity for possible rewiring later.

The proposal to substitute No. 9 and No. 7 wire in place of No. 10 and No. 8 wire was not adopted.

Article 338

The proposal to prohibit the use of non-metallic sheathed cable in locations which might be damp, as around farms, was ruled out. The present Code text was retained.

The proposal to require non-metallic outlet and switch boxes on non-metallic sheathed cable installations where a continuous water pipe ground is not available was defeated. This means that the common practice of using metal boxes on these installations may be continued.

A technical sub-committee was appointed to study the possibility of developing a single intermediate weight conduit to ultimately replace rigid metal conduit and electrical metallic tubing.

Article 410

This article was completely revised to cover fluorescent and other electric discharge lighting sources and equipment. New rules will be included to cover both the so-called hot and cold cathode fluorescent lighting for domestic, commercial and industrial installations. Voltage limits set were 1000 v for residences and up to 15,000 v for other occupancies, with certain limitations on milliamperes of current in the higher voltage systems.

Dead-front lampholder construction will be required for all such devices excepting, of course, the present Edison base type lampholders.

Article 422

New rules applying to infra-red appliances will permit of the present day practice of placing lamps in series across 230 v or 460 v circuits.

Article 430

Changes were made in the motor Art. 430 intended to offer better protection and reduce failures. Protective devices integral with a motor and responsive to motor current or to both motor current and temperature were recognized.

The new Code will require three running overcurrent devices for three-phase motors in all cases where the supply is from a Y-Delta or Delta-Y transformer bank having the Y neutral in either case ungrounded and not connected to the circuit. This should tend to eliminate motor failures and burnouts caused by excessive secondary current unbalance when one-phase of the primary supply is interrupted to such transformer banks. Ref. Section 4327.

Article 450

The new text of Article 450 is a complete rearrangement and revision of the 1940 Code. Also new provisions have been added to cover modern dry-type transformers and low voltage network distribution systems in buildings. The last mentioned subject will be covered for the first time in the new Code under the caption "Secondary Ties."

Article 460

This article has been brought up to date by deleting special provisions for step-up transformers which had to be used before low voltage capacitors were available. The new draft specifies the current-carrying capacity required for capacitor circuits and gives the maximum rating of capacitors approved for use with the standard ratings of open-frame, 60 cycle, 3-phase induction motors.

Article 500

This article on hazardous locations was completely revised with the intention of improving the rules and making them more practical for use in field. Specific rules in some instances were tightened, but in general the revisions represent some liberalization; for instance, the new rules will no longer classify a whole area as hazardous if one small section contains a hazardous operation.

Article 630

The supply circuit wiring for electric welders is covered for the first time in this new article in the Code. The intent is to permit the use of conductor and associated equipment rated according to the maximum duty cycle to which electric welders are subjected.

Article 710

The voltage limit above which high voltage conductors have to be terminated in a transformer vault has been raised from 7500 to 15,000 v.

Shielding of rubber-insulated conductors operated at more than 2 kv or 6 kv according to the method of installation will be required for the first time as a means of minimizing damage by ozone.

The maximum circuit voltage for which fuses may be used has been raised from 7.5 to 15 kv.

General

Looking into the future, the chairman was empowered to appoint committees to study the problems peculiar to farm wiring, hospitals, and high frequency heating equipment.

Comment

All groups were apparently fairly well satisfied with the results of the Electrical Committee meeting. Considering the fact that this revision was rather extensive following the long five-year wartime gap with many emergency provisions, it is encouraging to note that a workable Code could be agreed upon mutually by the widely diversified interests.

The light and power industry will be pleased with the recognition of the new forms of insulation for conductors, particularly those with reduced thickness, and without reducing the size of conduits on new installations but allowing for increased capacity later. They will also favor the reduced demand factors for electric ranges, reduced size neutral, grounding of range frames to neutral, and continued and broadened recognition of non-metallic coverings for use where applicable.

The utility industry will in general object to the continued requirement for

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Residential and Farm Wiring Design Handbooks to Be Published Early in 1946

RESIDENTIAL wiring systems planned to permit the home owner to enjoy all his present appliances, and to add new electrical servants in confidence that their service will not be impaired by lack of outlets or current, are presented in the "Handbook of Residential Wiring Design," a 32-page booklet to be published in February by the all-electrical Industry Committee on Interior Wiring Design, representing ten leading trade associations and technical societies in the electrical field. Also prepared by the committee and to be published in March is a 64-page "Handbook on Farmstead Wiring Design."

The residential handbook is a complete revision of the residential standards appearing in the Handbook of Interior Wiring Design published in 1937, and is now available for the first time under a separate cover. The farmstead handbook is the first of its kind to be published.

Wide distribution of these two handbooks—approximately 100,000 have been ordered in advance of publication—will give practical help in presenting the electrical industry's postwar wiring programs to the public. It is expected that individual companies as well as associations in various fields of the electrical industry will take part in widespread distribution of the two publications. A key to wider distribution is the small unit price of the publications when ordered in quantities of 1,000 or more.

Both booklets are the result of over a year's planning and preparation by the joint committee representing the following organizations; American Institute of Electrical Engineers, American Home Lighting Institute, American Society of Agricultural Engineers, Edison Electric Institute, Illuminating Engineering Society, International Association of Electrical Inspectors, National Electrical Contractors Association, National Electrical Manufacturers Association, National Electrical Wholesalers Association, and Radio Manufacturers Association.

The handbooks, it is felt, will be of substantial aid to architects, engineers, builders, contractors, lending institutions, and other organizations concerned with home building and planning. Prospective home owners and those now planning remodeling of their present homes will find practical, efficient wiring systems, with both floor plans and text easily understood by men with no technical experience.

The residential handbook summarizes the latest authoritative experience of the electrical industry on wiring systems adequate for present and future needs in the home. Both floor plans and text show how every room in the average home should be wired, with the number, type, and location of outlets recommended by the committee's experts. Pages on circuit requirements, service entrances and a sample wiring specification form are included, with electrical symbols for floor plans.

The need for better wiring in old homes and for the millions of dwellings to be built in postwar years has long been obvious to the electrical industry. Ten or fifteen years ago, perhaps five or six electrical apliances, besides lighting, were at work in the average home. Today, not only are there more appliances, but lighting also has become much more extensive. Improved electric ranges, irons and lights and other appliances generally require more wiring capacity than formerly, because users demand constantly higher standards of performance and convenience.

The residential booklet makes clear the loss of efficiency in electrical equipment when the load outstrips the capacity of the wiring system, pointing that a 5 per cent voltage loss along a house circuit can cause a lamp near the end of the circuit to provide 17 per cent less light.

Both handbooks emphasize that they are intended to show how to *plan* wiring, not how to make the actual installations.

The "Handbook on Farmstead Wiring Design" offers comprehensive guidance to anyone planning farm wiring layouts, either for the first electrification of the farm, or to improve present wiring to save labor, cut operating costs and enjoy more city conveniences with electrical appliances.

Wiring for the farmer's first requirements—lighting and running water—should be so planned that additions can be made quickly and economically for dairy structures, poultry houses, stables, hog pens and other needs.

The Handbook covers interior wiring for every farm building, showing recommended locations for convenience and lighting outlets, and branch and feeder circuits. Exterior distribution systems are discussed at length, as are pole and outdoor metering. Tables and data on demands, wire sizes and voltage drop are also included.

In speaking of the constantly expanding need for electricity on the farm, the handbook states:

"In 1930, a three-wire, 60-ampere service was considered adequate for most farms, even in dairy regions. Today the development of new equipment has reached a point where some farmers are finding 100-ampere service inadequate. Providing adequate capacity when the interior distribution system is first installed will usually entail but a fraction of the cost of making changes at a later date."

Both the residential and farm handbooks are written to be easily understood by the average farmer or home owner. The practical information they contain, however, will be valuable to architects, builder, agricultural agents, and various agricultural institutions.

Members of the Industry Committee on Interior Wiring Design are E. A. Brand, Buffalo Niagara Electric Corp., Chairman, and A. C. Bredahl, Westinghouse Electric & Manufacturing Co., Secretary. Representing Edison Electric Institute are Mr. Brand, and H. R. Stevenson, The Detroit Edison Co.. Representing the Illuminating Engineering Society are Mr. Bredahl and Leo Delkart, Leonard Construction Co.

Representing the American Institute of Electrical Engineers are M. M. Brandon, Underwriter's Laboratories, Inc., and L. C. Peterman, Ford, Bacon and Davis, M. H. Lloyd, Buffalo Niaga-

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500-Kv Transmission Test Line Planned

THAT most necessary commodity, electric power, never had to be rationed in this country during World War II. The same forward thinking, the same careful planning that enabled the electric power industry to take both the civilian and war demands in stride are again in evidence. Looking to the immediate future, when even larger blocks of power will be needed to produce goods for the rehabilitation of much of the world, Philip Sporn, Executive Vice President and Chief Engineer, American Gas and Electric Service Corporation, has initiated an investigation of the problems attendant upon transmitting power at voltages as high as 500,000 volts.

In cooperation with nine manufacturers, namely—

Westinghouse Electric Corporation
General Electric Company
American Bridge Company
Aluminum Company of America
Anaconda Wire and Cable Company
General Cable Corporation
Phelps Dodge Copper Products Corporation
Ohio Brass Company
Locke Insulator Corporation

the American Gas and Electric Service Corporation plans to erect for test purposes two 3-phase power lines adjacent to the Tidd Generating Station of The Ohio Power Company at Brilliant, Ohio. Participating in this work will be not only The Ohio Power Company, but the other two principal companies of the Central System, namely, Appalachian Electric Power Company and Indiana & Michigan Electric Company. These mile-and-a-half power lines will be so built and equipped that thorough studies can be made of some of the important factors that control the economic application of transmission voltages higher than 287 kilovolts, the present maximum voltage used.

Investigations will be centered about corona loss, radio interference, and insulation coordination at high voltages. Tests will be made at voltages from 264 to 500 kilovolts. These investigations are expected to provide essential data for the design of transmission lines and terminal equipment for the economical transmission of power at these high voltages in the relatively near future.

Present plans call for materials and equipment for these investigations to be supplied as follows:

Westinghouse will provide the high-voltage transformers with lightning arresters and the metering equipment to energize the line. Metering equipment of high sensitivity and accuracy will be provided for measuring corona loss and other test phenomena not only for selected conditions, but also for weather conditions as encountered throughout the year.

The transmission line towers to be supplied by the American Bridge Company will be designed so that various conductor spacings can be used. These towers will permit close simulation of actual service conditions by having three phase conductors and two ground wires.

Transmission line conductors of various types and sizes will be supplied by the Aluminum Company, Anaconda Wire and Cable Company, General Cable Corporation, and Phelps Dodge Copper Products Corporation. Tests on the conductors will be made under varying conditions of weather, spacing, and insulator string length.

Switching equipment designed for a higher voltage than any heretofore built with lightning arresters, current transformers and potential devices will be supplied by the General Electric Company, in order to obtain experience on these important elements of station equipment.

Insulators and hardware will be provided by the Ohio Brass Company and the Locke Insulator Corporation.

Construction of transmission lines for voltages in excess of the present maximum operating value (287 kilovolts) is technically feasible at this time, based on experience with lower voltage designs. However, lower cost construction is expected to result from the data which will be obtained with the proposed installation, as the extended knowledge should permit more closely evaluating the margins now believed necessary in the selection of conductor diameter, spacing, insulation levels of line, and terminal apparatus. The purpose of American Gas and Electric Service Corporation in undertaking this investigation is to provide authentic data and information to permit balancing the factors that influence high-voltage transmission and to find the basis for the most economical design for transmission of large blocks of power.

Godley Appointed EEI Rural Service Manager

ROY GODLEY, at present Head of the Rural Department, Monongahela Power Company, will assume the newly established position of Rural Service Manager in the Commercial Department of the Edison Electric Institute, effective Feb. 1, C. W. Kellogg, president of the Institute, has announced. In this position, Mr. Godley will assist the electric industry in expansion of its rural electrification activities, including the fostering of all types of applications of electric service with the view of increasing the farm income, particularly that of the self-subsistence farm. He will also engage in furthering cooperative relations between the electric industry and all other groups and organizations interested in agricultural development.

A graduate of Oklahoma A & M College in 1932, Mr. Godley received a Master of Science degree in agriculture at West Virginia University in 1934. From that year until 1936, he was County Agricultural Agent, Ritchie County, W. Va. In 1936, he joined Monongahela Power Co. as Agricultural Counselor, and in 1944 became Head of the Rural Department.

While with the power company, Mr. Godley formulated an agricultural development program, known as Farming for Better Living, designed to supplement the work of such agencies as the Agricultural Extension Division in increasing farm income. The program was established in ten counties of the Monongahela Power Company's territory in 1939, and has since been expanded to twenty-two of the thirty counties in the company area.

Mr. Godley also assisted in the establishment of an Annual Rural Electrification Conference in West Virginia, with power companies and agricultural agencies participating.

Mr. Godley is a past president of West Virginia Junior Chamber of Commerce; chairman of the Postwar Activities Committee, U. S. Junior Chamber of Commerce, 1943-1944; member of Equipment Distribution Committee and Sales Personnel Committee, Edison Electric Institute, and an associate member of the American Society of Agricultural Engineers.

Possibilities of Atomic Power

By L. W. Chubb
Director, Research Laboratories, Westinghouse Electric Corporation

AN attempt to set atomic power into its proper place in the engineering world is about as difficult as a prophecy of the future of electricity might have been at the time of the first electric lamp. Only more so. Generation and production of electric power were allowed to follow a natural course as dictated by engineering developments and economics. But superimposed on the technical developments of atomic power will be political and military controls, the extent and effects of which are still undetermined. In appraising the technical and economic possibilities of atomic power, however, a few facts stand out clearly.

1. Atomic power is an actuality. The atomic-energy piles at Hanford, Washington, are continuously delivering several hundred thousand kilowatts of thermal energy, enough to raise sensibly the temperature of the Columbia River.

2. The cost of that energy, which is a byproduct, if known, has not been made public. It would seem, however, that it must be high, probably many times that of other fuels. The costs of preparing sufficient purified uranium for practical piles are likely quite high. Furthermore, complete "burning" of a prepared lump of uranium is not possible. Just as ash accumulates around a chunk of burning coke, which tends to slow down or stop the combustion, so the nuclear processes produce substances that retard the reaction. In a relatively short time the "poisoning" reaches such a degree that a complete and expensive refining operation must be performed or the uranium discarded.

3. Controllable atomic-energy generators of smaller size and weight are possible now. However as the size comes down the richness of the fissionable material must be increased. Costs rise astronomically with degree of enrichment.

4. The fission products are strongly radioactive for periods varying from seconds to years. Radiations from the power source are extremely hazardous to any form of life. Protective measures require thick barriers of appropriate materials. The bulk and weight of safety devices for small power plants would thereby far exceed that of the pile itself.

5. Fission is now accomplished with uranium isotopes, and plutonium which is derived from uranium. The amount of uranium ore and its distribution over the earth, if known, has not generally been disclosed.

6. Nuclear reactions to achieve energy release with other elements is theoretically possible and may be practical although no announcement of such has been made. Thorium is one possibility. It should be remembered that heat is available either by fission of heavy atoms into elements near the middle of the atomic scale, or by synthesis of lightweight elements into higher ones. Heat from the sun is thought to be energy released from the combination of hydrogen atoms with helium atoms by successive nuclear reactions.

7. Atomic power almost assuredly will become a practical power source, likely apparent application is for ship propulsion, or large power and heating plants using atomic fuel. Small-size power plants for private vehicles appear impractical. Above all—aside from governmental controls—the laws of economics will apply. Inasmuch as fuel costs are only a portion, sometimes quite small, of the total power-production costs, investment costs and special performance requirements may be the deciding factor. If the equipment costs for an atomic power plant are high, the plant may not be able to justify itself even if the atomic-reaction material were to cost nothing.

These practical difficulties, large though they be, should not obscure the fact that atomic power presents to the technical man enormous, fascinating opportunities and to the average citizen the greatest force of all time, for good or evil as he sees fit to use it.

1946 Starts With "Warming Up" Period

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postwar planning, the urge for a promotional program on the theme of Electrical Living has been expressed. The objective has been to use this theme, with an appropriate slogan and design, as a backdrop to all household equipment selling, and as a common denominator for all electrical services contributing to comfortable, convenient and efficient operation of the home.

A joint committee of members of Edison Institute and the Association of Edison Illuminating Companies has labored with this project. The past five weeks have brought accelerated action so that the final Plan Book and mailing piece which will be used to break ground in the Program are ready for the print This means still more promotional tools in the hands of the Commercial forces for action.

As we start this first full peace-time year, there will be an urge on the part of the electric utility to regain its profitable loads. More electricity for more people, at lower average rates, is the basis for giving full meaning to Electrical Living. There is an obligation in this objective. As Mr. H. P. Liversidge, President of Philadelphia Electric Company, pointed out in his address before the last Convention of PEA: "The selling of Electrical Living requires teamwork of the employees of a company for achievement. It threads from the details of supply through to an organized system of maintenance." Mr. Liversidge emphasized that manufacturer, distributor, retailer and utility are tied in with that obligation.

Now in all of our selling effort we are concerned with *People*. They are the ones that count, and our training efforts are assisting men and women in commercial activity to know the reactions of people. Promotional materials produced by the Institute are a part of the tool-kits for moulding the sale. It is hoped there will be wide demand for them.

Let Commercial men be undaunted by the foggy conditions that surround electrical development at present. Through the fog of many restrictions, there looms greatest sales opportunity. The seller's market may be of short duration. Now is the time to set our sights to peak objectives and to organize promotional promotional programs and plan dynamic sales action locally to achieve them.

What Causes Accidents and How to Prevent Them

By Kay Baird

This essay won first prize in a Safety Article Contest recently conducted for employees of the Southwestern Public Service Company. The author is crew foreman for the Amarillo, Texas, Line Department of the Company.

THE great majority of accidents are caused by bad working habits.

The science of safety engineering has advanced to the point that more than 80 per cent of recorded accidents are classed as due to the *human element.* Assuming the safety of the group as a whole is the responsibility of each individual and the cooperation of every worker concerned must be enlisted. When we say that the majority of accidents are the result of the *human element,* safety automatically becomes a personnel problem. Personnel problems can be solved by good leadership. My definition of leadership is "That quality which makes others want to cooperate."

Safety must come from the top. The management must realize that safety and efficiency are one. Unsafe speed means poor work which requires more subsequent maintenance than good work. The management must provide and endorse adequate rules and regulations for the safety of the employee and must provide competent supervision to see that these are carried out. The management having provided the safety engineering, the tools, and protective equipment for the work to be done, safety becomes a problem of educating individuals in the right habits for performing the work safely.

The attitude of a group of employees toward safety is generally in ratio to the attitude of their direct supervisor, the one who is on the job in the actual performance of the work. This supervisor, if he is the right man, is a specialist in his line of work. He knows his tools and equipment, the hazards of any work his group must perform. He has probably been trained in accident prevention. But, has he been trained to teach it to others?

He can investigate an accident to determine the cause. Can he also recognize the good habits of the worker who has performed the same operation many times without mishap and train others to perform it in the same manner? He will discuss with the group new or unusual jobs before attempting to do them. Can he incorporate his ideas and their suggestions into a safe plan of operation? Can he instill pride in their job to the extent that their habits of living off the job are an aid to their work?

Every department in an organization has outstanding men, men who have the quality of leadership. Train these men in accident prevention and, *most important,* train them to teach others. With these leaders, specializing in the safety of their department by personally bringing safety to the individual workers under the supervision of the Safety Director, the safety effort would be decentralized and more effectively diffused throughout the organization.

With the individual workers converted to safe working habits through the leadership of trained men, organization-wide prevention of accidents would be assured.

Utilities' Load Curve Restored to Pre-War Pattern

THE termination of war contracts and the abolition of winter daylight saving have restored the utilities' load curve to its prewar pattern, according to advices received by the Edison Electric Institute from a number of its member companies.

For the country as a whole, the traditional shape of the December load curve consisted, up to 1942, of a morning peak between the hours of 10 and 11, then a mid-day sag, followed by an evening peak which came between 5 and 6 o'clock and which on the average was about one-eighth higher than that of the morning. As the war developed, the expansion of industrial production caused the morning peak to rise to the day's high point between 9 and 10 a. m. It is probable that an even greater peak was established during the following month of January an hour earlier, when the effect of "daylight saving" was reversed and people went to work in the dark. The end of daylight saving has necessitated the turning on of lights during winter evenings an hour earlier than last year, with the result that, as far as the demand on the power systems is concerned, this additional load about balances the loss of business through the termination of war contracts and the "peak" once again comes between 5 and 6 o'clock of the afternoon.

EEI Rate Research Committee Appointments

EDWARD N. STRAIT, Manager, Rate and Research Division, Public Utility Engineering and Service Corp., Chicago, has been appointed Chairman of the Rate Research Committee of the Edison Electric Institute, succeeding the late Frank Newton, and L. R. Lefferson, Rate Department Head, Ebasco Services, Inc., New York, has been appointed Vice Chairman of the Committee.

Mr. Strait has been connected with Public Utility Engineering and Service Corp. and its predecessor companies since 1916, during which time he has been in charge of their rates and related matters. He was formerly with the Public Service Commission of Wisconsin, serving as valuation engineer, service inspector and chief statistician, among other duties.

He is a graduate of the University of Wisconsin, from which he received the degree of Electrical Engineer in 1912, Mr. Strait is an associate member of the Illuminating Engineering Society, and the American Institute of Electrical Engineers.

Mr. Strait has been a member of the Rate Research Committee since 1926, and Vice Chairman since 1943.

Mr. Lefferson, who now becomes Vice Chairman of the Committee, served from 1915 to 1918 with one of the companies later merged to form Pennsylvania Power & Light Company. In the latter year, he joined Electric Bond and Share Company as a rate engineer.

He became assistant Rate Department Head in 1926, and Rate Department Head in 1933, retaining that position with the formation of Ebasco Services Inc., in 1935.

Mr. Lefferson has been a member of the EEI Rate Research Committee since its inception, and has taken an active part in the Committee's activities.

On Choosing the Electric Industry for a Career

A letter from a prominent executive of the industry to a professor in the school of business of one of the foremost universities in the country.

DEAR PROFESSOR . . . .

Your letter . . . . asking advice on the question of the opportunities for young men for a career with electric light and power companies presents very interesting questions, especially the one you raise as to the outlook for men rising to executive positions upon proved ability.

Such questions have often been put to me not only with respect to the electric utility business but with regard to other lines of industrial activity. My experience in business, which runs back over 42 years, has indicated to me that it is rather the exception than the rule when a man who attains an executive position has deliberately started out after that particular job when he graduated from college. The result seems to come rather from the cumulative effect of the combined characteristics of mind, character and personality which each individual possesses and gradually impresses upon his associates in the concern with which he is connected. For example, in our business some executives have worked up through the accounting and financial end of it, others started out as lawyers, others as engineers and others as commercial men interested primarily in the development of sales. Whatever the point of origin, however, the successful man in our business, from its very nature, must have those broad, human sympathies which will make him successful in both public relations and in the inspiration and organization of the operating forces.

Naturally, of course, a man has to start doing some specific thing. Day to day operation of the electric utility business involves three main functions. The generation, transmission and distribution of our sole product, electric energy, is, of course, an engineering problem and anyone starting in the operating department should, therefore, have engineering training along the appropriate lines. A second main division of the business is accounting which includes not only the financing and bookkeeping, but also the collection of earnings. A third main division is its commercial aspect involving the sale of the product which is essential not only for the financial success of the undertaking, but for adequate service and the lowest feasible rates to customers. All three of these, as above suggested, are infused with the problems of public relations which, if not satisfactory, can render all the other work much less effective.

No doubt these general considerations apply to many other lines of business and I have felt, in advising young men as to where to start out in business, that one of the most important considerations is the breadth and stability of the business itself, since I can think of nothing so disheartening as for a man to spend the best years of his life in a business that is either so circumscribed in its activities or ephemeral in its nature that after all the years of hard work he finds he has arrived nowhere. In this respect I consider the electric utility business ideal as its interests are as broad as the whole life of the people. For this very reason I know of no business less affected by variations in the business cycle and I know of no business where a man can feel his efforts are doing more to conserve the general welfare. Furthermore, the breadth of these interests give a well-nigh unlimited field for thought and imagination and for the exercise of those talents in human relationships which are so endless in their ramifications and opportunities.

In my experience the most difficult thing for a young man starting out in business life to learn is patience. An ambitious young man just starting out sees all the important jobs ahead of him apparently firmly anchored down by people in apparently excellent health so that opportunities for him may seem very slight. He should reflect that all of the men ahead of him in executive positions have gone through the same trying beginning that he finds himself in and that the thing for him to do is to learn the details and principles of his business and prepare himself for promotion when the time comes. I realize that this requires patience, but patience as a rule, is the last thing a vigorous and ambitious young man thinks of or wishes to exercise.

As you probably gather, my experience has indicated that you cannot keep a good man down and that probably the most important decision a young man has to make in starting out his business career is to get into a line of business in which he can feel an interest and in which the field is broad enough not to circumscribe real ability. In my own opinion, the electric light and power business meets both of these tests.

Lawrence G. Tighe

LAWRENCE G. TIGHE, vice president, director and Akron division manager of the Ohio Edison Co. since the formation of the company in 1930, died suddenly of a heart attack at St. Thomas Hospital, Akron, on December 6. He was 59 years of age.

A native of Saratoga Springs, N. Y., Mr. Tighe became interested in electricity at an early age and when he finished school, he secured employment as an office boy in the works of the General Electric Co., Schenectady. Winning several promotions, he served the company in Detroit and Jackson, Mich., but left G. E. in 1913 to join Consumers Power Co. in Jackson, controlled by Hodenpyl, Hardy & Co.

When Hodenpyl, Hardy & Co. took over the management of the then Northern Ohio Traction & Light Co. in 1916, Mr. Tighe was sent to Akron as general superintendent of production and distribution of the light and power division of the company. He was made assistant general manager of the company in 1925. The name of the organization was changed to Northern Ohio Power & Light Co. in 1926. When the Ohio Edison Co. was formed in 1930 as successor to the Northern Ohio Power & Light Co. and a number of other utilities in Ohio, Mr. Tighe was elected to the position which he held at the time of his death.

Citizens of Akron probably knew him best for his multitude of activities in promoting community interests. He had headed up or been a member of practically every committee or organization that has undertaken any project for the civic betterment of Akron in the past 15 years. In 1938 he was named Akron's "Man of the Year." Again in 1942 he was cited as one of the city's 20 outstanding men and women for 1941 for "outstanding work in organizing the Akron Area Civilian Defense Council."

Personnel Policies Discussed at Northwest Association Meeting

THE fall meeting of the Personnel Section, Northwest Electric Light & Power Ass'n, at Seattle Dec. 5 and 6, 1945, brought together 25 personnel directors of member utility companies and members of their staffs for a discussion of various phases of personnel work. Six committees, organized under R. H. Sessions, Idaho Power Co., Section Chairman, explored their respective subjects and laid plans for continuing studies to be reported at the next Section Meeting, tentatively scheduled to be held in Salt Lake City next May.

The committee on Sick Leave Compensation and Medical Aid, headed by L. W. Nims, Utah Power & Light Co., found a wide variety of practices with respect to payment of sick leave compensation, and came to the general conclusion that a well defined policy should be established and be made known to the employees. It was generally agreed that a company should set up rules covering excused absences. The committee agreed to study the question of vacations and excused absences.

Donald W. Prairie, Northwestern Electric Co., recently returned from military service and placed in charge of his company's personnel department, acted as chairman of the Physical Requirements Committee. In the discussion of this subject, most of the companies were found to require physical examinations, and it was generally agreed that these should be conducted with the examining doctor knowing the class of job the applicant is to take. There should be a follow through on the employee's physical record by periodic re-examination.

The swing toward the social aspect of personnel work has thrown considerable emphasis on insurance and pension plans, stated Kimball Jack, The Washington Water Power Co., acting chairman of the Insurance and Pensions Committee. Employees seem more interested in the security that comes from pensions than in insurance. Ample safeguards should be thrown around any pension plan that is established, and once established the company should not be permitted to withdraw or discontinue it. Pension plans should be fully published to the employees so that the most can be made of the morale building affect of such plans.

Because many companies in the Association have turned over their accident prevention and safety work to the personnel department, the Accident Prevention Committee of the Association has been transferred from the Engineering Operation Section to the Personnel Section, with J. T. Bradshaw, Puget Sound Power & Light Co., chairman. The committee contains engineers as well as safety men, however, and a close cooperation is maintained with the Engineering Section, because it is recognized that the engineers have responsibility for designing safe working standards.

The field superintendent is a key man in any effective safety program, said Mr. Bradshaw. Union problems should not be permitted to come up in safety meetings. Every opportunity should be taken to dramatize safety wherever possible by the use of moving pictures or mechanical devices. An example of the latter was a demonstration of the proper way to lift, through the "Yohoodie" figure made by Puget Sound Power & Light Co. for showing to employee groups. The safety men were admonished to know the safety code rules under which they work and the electrical inspectors who administer this code.

Most of the discussion in the Planning Committee, under C. W. Sherman, Puget Sound Power & Light Co., chairman, revolved around problems related to the returning service man. One of the problems encountered has to do with the man who has advanced rapidly in the service, perhaps beyond the capacity required for his former job in the company. Most generally adopted policy in such cases is to place the man in the job he had when he left with the idea of promoting him as rapidly as possible. One company proposes not to do much up-grading until all the men get back and the abilities of all can be appraised. It was pointed out that the companies have a moral obligation to take their share of young men returning from service who went in direct from school and never worked before. Some companies are doing a lot of education with returning veterans, informing them of their rights under the GI Bill, giving them the benefit of an interview by a psychologist and attempting to place them where they will be happiest. One company has adopted the policy of placing returned veterans in the advanced status of employment that they would have attained had they not gone to war.

There was considerable discussion of what constituted an efficient personnel department and it was found that this depends in large part on the functions assigned to the department by management. Considerable variation in these functions obtains among the companies represented in the Association.

In a discussion of the place a personnel department should occupy in a utility organization, the following general ideas were advanced: that the personnel functions in a utility company should be handled by a department and not by some official as a side issue; that the department should attempt to bring the thinking of personnel men up to top management; that the department should not work too close to top management, but should be a place where the employee can get his story heard without embarrassment; that the department should make plans and recommend policy and then administer the policy after approval by top management.

Edison Medal Awarded to Philip Sporn

THE Edison Medal for 1945 has been awarded by the American Institute of Electrical Engineers to Philip Sporn, executive vice-president, American Gas & Electric Service Corporation, "For his contributions to the art of economical and dependable power generation and transmission."

The medal will be presented to Mr. Sporn on Wednesday morning, January 23, 1946, in the Engineering Auditorium, 33 West 39th Street, New York, in a general session of the Winter Convention of the American Institute of Electrical Engineers, to be held January 21-25.

The Edison Medal was founded by associates and friends of Thomas A. Edison, and is awarded annually for "meritorious achievement in electrical science, electrical engineering, or the electrical arts" by a committee composed of 24 members of the American Institute of Electrical Engineers.

PERSONALS

At a meeting of the Board of Trustees of Consolidated Edison Co. of New York, Inc., on December 26, JAMES F. FAIRMAN was elected vice president in charge of production and operation. Mr. Fairman has been assistant vice president for design, inventory, testing, purchasing and stores. Production and operation have heretofore been under the jurisdiction of Executive Vice President Hudson R. Searing.

HAROLD S. SUTTON, executive assistant to the president, was elected treasurer of the company, effective February 1, 1946, to succeed WILLIAM F. O'BRIEN, who on that date will retire under the company's retirement plan after 46 years of service.

DR. JOHN J. WITTMER, personnel and medical director, was elected an assistant vice president, industrial relations. ARTHUR L. BLOCK, who has been cashier, was elected an assistant treasurer.

COLIN C. SIMPSON, who has been assistant vice president, production and operation, became assistant vice president for design, inventory, testing, purchasing and stores.

Other year-end changes in the Consolidated Edison organization included the appointment of EDWARD E. HILL, who has been associate manager of electric production, to the post of executive assistant to the exeeutive vice president. WILLIAM E. ASCHENBRENNER, who has been an assistant cashier, was made cashier.

Mr. Fairman has been with the Consolidated Edison System Companies since 1925. He was with Brooklyn Edison Company until 1937 when he was transferred to Consolidated Edison. Mr. Fairman is a vice president of the American Institute of Electrical Engineers, a director of the National Society of Professional Engineers and a past president of the New York State Society of Professional Engineers.

Mr. Sutton has been executive assistant to the chief executive officer of the company since he joined the company in October, 1935.

Dr. Wittmer joined the Edison System as a physician with Brooklyn Edison Company in 1924. He has been personnel and medical director since 1938.

Mr. Block was employed by the Consolidated Gas Company as an office boy in 1906. He was made assistant cashier of the company in 1923 and was made cashier in 1936.

Mr. Simpson was employed by Consolidated Gas Co. as a rodman in the mains and service bureau of the Distribution Department in 1904. He became an engineer in that department in 1911 and in 1915 general superintendent. In 1940 he was elected an assistant vice president of the company. He was commissioned a Captain in the Engineering Corps and served with the A.E.F. in World War I.

Mr. Hill joined the company in 1904 in the meter testing bureau. He has been assigned to many duties in the company, most of which were concerned with electrical engineering.

Mr. Aschenbrenner joined the Edison System in 1908. He was made cashier of The New York Edison Company in 1934, and in 1936, following the merger of the New York Edison into Consolidated Edison, he became assistant cashier.

Announcement has been made by President George H. Blake, of Public Service Electric and Gas Company of New Jersey of the following organizational changes in the company's publicity and advertising department in connection with the retirement of WALTER FOX ALLEN as director of publicity:

ROBERT A. ZACHARY, vice president in charge of public relations, will head the publicity and advertising department.

JOSEPH A. GALLAGHER is named director of publicity.

THOMAS H. SPAIN is named director of advertising.

S. EARLE CLAUSS will be assistant director of publicity.

Mr. Zachary has been vice president for the past six years, a director of the subsidiary companies since 1941, and has been associated with Public Service since 1930. Mr. Zachary lives in South Orange.

Publicity manager since 1942, Mr. Gallagher has been in the Publicity Department of Public Service twenty-one years. Prior to that he was a reporter and later sports editor for the Plainfield *Courier-News* and also worked for the Newark *Sunday Call*. He lives in Plainfield.

Mr. Spain has been with Public Service since 1927 and for the past eight years has been advertising manager. He is a director and past president of the Public Utilities Advertising Association and lives in Morristown.

S. Earle Clauss, who lives in East Orange, was a reporter with the Bergen *Evening Record,* Hackensack, for eight years prior to becoming a publicity assistant in the Publicity department of Public Service in 1937.

EDWARD H. HEGMANN has been appointed General Auditor of the Philadelphia Company and subsidiary companies, Pittsburgh, Pa., C. T. Harmon, Controller for the companies, announced recently. Mr. Hegmann was formerly Auditor of Receipts.

Born in Pittsburgh, Mr. Hegmann received his elementary and secondary school training in the public schools of Fredonia, New York, and was graduated from the University of Pittsburgh's School of Business Administration in 1930, with a bachelor of science degree. He began his business career in April, 1930, as an accountant for the Pennsylvania State Water Company, Washington, Pa., where he remained until June 1936, when he became Office Manager and Cashier for the Lexington Water Company, Lexington, Ky. He entered the employ of the Philadelphia Company and Subsidiary Companies as an accountant on September 1, 1937, and has since served as Assistant to General Auditor and Auditor of Receipts, the position he held at the time of his present appointment.

LAWRENCE J. MCGRAW, former Chief Clerk of the Companies' Beaver Falls Accounting Department office, has been appointed Auditor of Receipts, filling the position vacated by Mr. Hegmann. Mr. McGraw was born in Williamsport, Pa., and attended Duquesne University's School of Business and Accounting, and the School of Business Administration at Geneva College. He entered the employ of the Philadelphia Company and Subsidiary Companies on May 1, 1924.

WILMER J. HADLEY has been appointed to Mr. McGraw's former position of Chief Clerk, Beaver Falls. Born and educated in Pittsburgh, Mr. Hadley has been with the Philadelphia Company and subsidiary companies since Oc-

tober 14, 1918, serving in various capacities in the companies' accounting department.

L. R. PARKER, who has been general supervisor of appliance merchandising of the Commonwealth & Southern Corp. and its predecessor companies for many years, has retired from that position and for the present has established himself as an independent merchandising consultant with headquarters in New York.

O. K. COLEMAN has resigned as assistant to vice president and chief engineer of the American Gas & Electric Service Corp., and moved to Mexico, Ind., where he expects to look after his farming interests and engage in consulting work. Mr. Coleman has been retained by the Duncan Electric Mfg. Co., Lafayette, Ind., and will be available for them on field applications. He has been in electric utility work since his youth, starting with a small isolated plant in Kentucky in 1914. Mr. Coleman spent one summer with Duncan in 1917, worked for Cincinati Gas & Electric Co. while attending University of Cincinnati and has been with the A. G. & E. system since 1923. He has been active in meter and code work.

GEORGE T. PARKINSON, district representative for the Utah Power & Light Co., at Bingham, Utah, since 1943, has been appointed manager for the company at Evanston, Wyo., succeeding R. I. WOOLLEY, who is now manager of the Rexbury division.

VERE C. HALLIDAY, for the past 20 years connected with the Utah Power and Light Co., has joined the company's general sales department staff in the capacity of sales promotion director. He will also assist in advertising and sales promotion activities. Mr. Halliday has a broad background of sales experience. He entered the power company's employ in 1924 as a member of the Salt Lake division, worked in various departments for two years and then was transferred to the Salt Lake sales department. In 1936 he was made salesfloor supervisor, in which position he remained until the company discontinued merchandising in June, 1942. Mr. Halliday was then assigned to a newly established department in the handling of War Production Board rules and regulations and construction applications pertaining to power company operations. Prior to taking his present position he was a member of the company's purchasing department.

WALTER E. BEATY, who has been connected with the Cincinnati Gas & Electric Co. and predecessor organizations for 44 years, has retired. Since 1930 he had engaged in work on estimates and budget control for the electric distribution department. He joined the Cincinnati utility in 1901 as electric meter reader and repairman and after advancement to head of the department was later transferred to the engineering department where he became assistant to the department head. In 1910 he was appointed assistant superintendent of electric distribution. When the Columbia Engineering & Management Corp. was formed in 1923, he was transferred to the new organization to take charge of electric transmission and distribution engineering work. He rejoined Cincinnati Gas in 1930.

PAUL BROWN, who has been eastern division sales supervisor of the Alabama Power Co., has been made merchandise sales director in the office of J. S. Sutherland, manager of the residential and commercial division.

SAMUEL STITES, Youngstown division manager of Ohio Edison Co., has been elected vice president of the company and Akron division manager to succeed the late Lon G. Tighe, and LAVERNE I. WELLS, assistant secretary has been elected secretary to succeed Charles H. Lahr, retired. RUFUS MOSES, for the past 19 years Sharon division manager of the Pennsylvania Power Co., has been appointed division manager of the Youngstown division of Ohio Edison Co., succeeding Mr. Stites. Announcement was also made of the promotion of JOHN I. EVANS to general purchasing agent, to succeed Harry B. Lingemann, retired.

Mr. Stites became identified with the utility industry when he joined the Nashville Railway & Light Co. in 1916. After military service in World War I, he entered the student engineering course of General Electric Co. at Fort Wayne, Ind., and the following year was transferred to Schenectady. He then went to Nashville as a sales engineer for G. E. In 1927 Mr. Stites joined the Consumers Power Co. in Jackson, Mich., as power sales engineer, subsequently being transferred to the company's offices in Battle Creek. In 1928 he was moved to the Muskegon division in the same capacity. Attracting the attention of the executives of the Commonwealth & Southern Corp., of which Consumers Power Co. is a subsidiary, he advanced rapidly, and upon the death in 1936 of C. S. MacCalla, Youngstown division manager of Ohio Edison Co., Mr. Stites was appointed to succeed him.

Mr. Moses, the new Youngstown division manager, is no stranger to the community, having formerly resided in that city for eleven years. A native of Sharon, he went to work for the Shenango Valley Electric Light Co., a predecessor of Pennsylvania Power Co., in 1910 as a storekeeper. All of his 35 years of business life have been spent with this utility company, its predecessors and affiliated companies. In 1915 he became superintendent of freight and passenger traffic for the Penn-Ohio system with offices in Youngstown and in 1917 he was appointed assistant manager of railways for the entire system. Subsequently he joined the Pennsylvania-Ohio Power & Light Co. and during this connection was instrumental in organizing the Electrical League of Youngstown. It was in 1926 that he was named division manager of the Sharon Division of Pennsylvania Power.

Mr. Wells joined Northern Ohio Traction & Light Co. in 1919 as superintendent of stores. In 1924 he was elected assistant treasurer and in 1930, upon the formation of Ohio Edison, became assistant secretary and treasurer. Mr. Lahr, retiring secretary, is the oldest employee in point of service, having been with Ohio Edison Co. and its predecessors for more than 53 years.

M. L. KAPP, assistant to the president of Interstate Power Co., Dubuque, Iowa, was elected vice president and assistant secretary at a recent meeting of the board of directors. In his new position, Mr. Kapp retains his responsibilities as assistant to the president in addition to his new duties.

Mr. Kapp joined Interstate Power Co. in 1933 following association with the Michigan Public Service Co., Traverse City, where he was vice president. As a young man he started work with the utility properties at Chandler, Okla. When the Oklahoma Natural Gas Co. later bought the properties at Chandler, he continued working with that company in various capacities until he left in 1936

to go with Michigan Public Service as assistant to the vice president.

GEORGE A. GRIMM has joined the staff of the Florida Power Corp., St. Petersburg, Fla., where he will be in charge of the transmission, distribution, engineering and production departments. C. B. McCarny will continue as superintendent of transmission and distribution and George E. Turner as superintendent of production.

Mr. Grimm has just returned from Japan, where he has held the rank of colonel in the U. S. Strategic Bomb Survey group. He had previously served as head of the power division in the Office of War Utilities of WPB. In this position he headed utility survey parties that visited major power plants in France, England, Germany, India, Mexico and other countries before going on the Tokyo assignment.

A native of Illinois and a graduate of the University of Wisconsin, Mr. Grimm was connected with the Commonwealth Edison Co. in Chicago for a few years following graduation from college, but for the period from 1928 to the time he joined the WPB, he was with the Indiana Service Corp. in an executive capacity.

Wiring Handbooks

(*Continued from page* 21)

ra Electric Corp., and C. P. Wagner, Northern States Power Co., represent the American Society of Agricultural Engineers.

F. N. M. Squires, New York Board of Fire Underwriters, and Charles A. Ward, of the City of Paterson, N. J., represent the International Association of Electrical Inspectors. Representing the American Lighting Equipment Association is D. L. Ripley, Markel Electric Products, Inc. Representing the National Electrical Manufacturers Association as voting members are L. F. Adams, General Electric Co., and Frank Thornton, Jr., Westinghouse Electric & Manufacturing Co.; as consulting members, H. G. Knoderer, General Electric Co.; H. E. Metz, Landers, Frary & Clark; William Seubert, Arrow-Hart & Hegeman Electric Co.; H. H. Weber, Wire and Cable Department, U. S. Rubber Company.

Allan Coggeshall, Hatzel & Beuhler, and George M. McKee, of G. H. McKee, Inc., represent the National Electrical Contractors Association. Representing the National Electrical Wholesalers Association is D. M. Salsbury, Westinghouse Electric Supply Company.

The detailed work of preparation of the texts of the two handbooks was under the general supervision of A. C. Bredahl as Chairman of the Technical Subcommittee, with H. R. Stevenson as Chairman of the group preparing the residential handbook, and M. H. Lloyd, as Chairman of the Group preparing the farm handbook.

PRICE LIST

Handbook of Residential Wiring Design		
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1000 or more copies	4c	"
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Tax Exemption Threatens

(*Continued from page* 6)

Treasury Department in November reported over four billion of untaxed income in 1944. These figures are in addition to income of government corporations and utilities and all charitable and religious organizations which file no returns. Furthermore, I have computed that there is a total of nearly $4 billion of governmental investment in multiple-purpose power projects, municipal utilities and similar projects largely devoted to electric power, all of which are exempt from Federal taxes and, to varying degrees, from local taxes. This aggregate investment is thus already nearly one-third as large as that of the entire electric light and power industry. The extent to which the integration of tax-exempt income has progressed, as shown by the figures just given, makes our calculus simile not so far-fetched after all.

Alleviation Must Be Effective

The alleviation of the unfair competition arising from the tax-exemption evil presents some practical difficulties. If, for example, the exemption from Federal income taxes should be abolished, it is doubtful if, in most cases, the abolition would result either in more tax revenue for the government or in the cessation of competitive rates or charges. The reason for this is that a governmental business, not being under the necessity to show any return and being able to pass all losses on to the taxpayer, can keep its costs down to a taxless basis and, in many cases, an interest-less basis and thus, by having no income, pay no income tax. Cancellation of exemption, therefore, not only would help the government revenues not at all, but would give the tax-exempt government enterprise a claim to a virtue, the absence of which some of them now feel much ashamed of, or at least squirm about.

The only effective way, therefore, to avoid the tax-exemption margin of government enterprises continuing as a competitive advantage would seem to be through some form of gross receipts tax. In the case of the electric utilities, the rate of such a tax would be fairly simple to compute, but it would vary with different kinds of business.

Summary

To sum up:

The load on the general taxpaying public from having to carry the burdens of tax-exempt or otherwise subsidized enterprises has already grown to such alarming proportions as to represent a serious threat to our national economy.

Such exemptions not only represent a corresponding increased burden on taxpayers, but, by the unfair competition produced, tend either to reduce their ability to carry this heavier load or to put them out of business entirely.

The fundamental danger which the tax exemption and other government subsidies serve to accentuate is an unbalanced Federal budget. Thirteen years ago, in his original Presidential inaugural address, Franklin Roosevelt pointed out "with the utmost seriousness" the expectation of a cumulative Federal deficit through June 1934 of five billion dollars. Now the budget hasn't been balanced for sixteen years and the deficit is over fifty times the figure that alarmed Mr. Roosevelt in 1933.

There are two converging factors to budget balancing: cutting down expenses and increasing revenue. Eliminating tax exemption and other government subsidies works along both of these converging lines; for, on the one hand, it will discourage, as nothing else can, foolish excursions of government into business and, on the other hand, make greater tax revenues without additional burden on the producing part of our economy.

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Complete Set—8th Conference 1944	2.00	2.00
" " 7th " 1943	2.00	2.00
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(Statistical Bulletins also available for years 1932 to 1939 inclusive) each	.30	.75
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power output; Monthly Electrical Research Statistics).	2.00	2.00

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F-2—Inductive Coordination of Rural Power and Telephone Systems—Engr. Report No. 40—Joint Subcommittee on Development and Research (1/38)	.80	2.00
E-9—Characteristics of Power System No. 39—Joint Subcommittee on Development and Research (11/37)	.60	1.50
E-5—Principles and Practices for Inductive Coordination, EEI-AAR (1/37)	no charge	no charge
E-4—Joint Use of Poles 6.6 and 13.2 kv. Safety Features—EEI-Bell Tel. (1/37)	.30	.75
D-14—Vol. IV—Engineering Reports of the Joint Subcommittee on Development and Research (1/37)	5.00	10.00
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M-1—A-C Network Operations 1941-1943 (1943)	.60	1.50 1.65
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K-10—Line Clearing Manual 1944 1-9 copies		35c.
K-6—Cable Operation—1941 General (9/43)	.50	1.25 1.35
K-4—A-C Network Operations, 1938-1940 (4/43)	.60	1.50 1.60
J-5—Ice and Wind Loading Tables for Overhead Line Conductors (Revision of Tables 85 to 96 of the Overhead Systems Reference Book) 1942 1-4 copies		10c.
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M-11—Report of Sales Personnel Committee October, 1945	.35	.35
Lighting		
Typical Promotional Programs—Home Lighting Equipment (1941)	.35	.35
Postwar Planning		
Section II—An Appraisal of Our Competition		.50
Section III—Rural Electrification		.25
Section IV—Industrial Power Markets		.25
Section V—Market Problems in Residential Field		.50
Section VI—Postwar Lighting Markets		.50
Power		
G-4—Electric Metal-Melting Furnaces (1/40)	.80	2.00
F-11—Electrification of Oil Refineries (10/38)	.30	.75
C-13—Steam and Electrical Requirements of Hotels (12/35)	.30	(members only)
C-2—Steam and Electrical Requirements of Office Building (4/35)	.30	.75
Power Sales Manual (1941) Plus Sec. 12-13-14-15	5.35	7.60
Water Heating		
1-5 Standardization of Electric Water Heating Equipment (10/41)	.20	.50

National Educational Programs

Commercial Cooking		
Commercial Cooking Survey, 1942	$0.25	$0.25
Sales Training Manual—Commercial Electric Cooking, 1941	1-4 copies	$1.50
	5-14 "	1.25
	15 or more	1.00
Domestic Cooking		
Meals Go Modern Electrically (Special prices in quantity)	.25	.25
Electric Kitchens		
How To Make It Happen in Your Kitchen	$2.25 per 100	
How to Plan a Modern All-Electric Kitchen	$2.00 per 100	
The Principles of Kitchen Planning	.25	.25

New Booklet Explains Functioning of Electric Service in Popular Comic Book Style

THE process of generating and distributing electricity, from boiler room to fuse box, is attractively presented for children and adults in a new booklet entitled "Jim's Adventure," prepared by Allis-Chalmers Mfg. Co., Milwaukee. Using the popular comic book technique, with full color drawings, the booklet takes an 8-year old boy on a tour of a power plant, substations, transmission and distribution lines, ending with an explanation of the electrical system in his own home.

At every step of the tour, simplified drawings and cross-sections of boilers, turbo-generators, circuit-breakers, etc., make clear the basic principles of operation. The dialogue between Jim and his uncle, who portrays a utility executive, explains the functioning of the power company's facilities in a brief, interesting manner. The booklet concludes with a glossary of commonly used electrical terms.

"Jim's Adventure" represents much research and creative effort. It has been published by Allis-Chalmers for the express purpose of meeting the needs of electric utility customer relations programs. Wide distribution should help in better educating the general public in how America is supplied with electric service.

Summary of Code Changes

(*Continued from page* 20)

type S fuses, but it can be pointed out that there has been considerable development in small breakers, and they will be available and used in quantity to offset some of the objection to the change in standards for fuses. There will also be some disappointment in the failure to recognize uninsulated neutrals for feeders in rewiring, but where needed to provide adequate capacity, some acceptable plan can usually be worked out locally to the mutual advantage of all concerned.

A catalog of EEI publications is available upon request to

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue, New York

	Members	Non-Members
Films		
"Dealer Education"—Series of 10 films and 10 discussion manuals. Five on basic selling and five on product selling, i.e., refrigerators, ranges, roasters, water heaters and laundry equipment. Price on meter basis for entire series	$125 to $275	
Lighting Booklets		
Better Light—Better Sight—Better Production	$1.50 per 100	
Better Light—Better Sight—Better Living	$3.00 per 100	
Better Light—Better Sight—Better Sales	$1.50 per 100	
Priceless Eyes	4.50 per 100	
Lighting Films		
"Let There Be Light" (Street Lighting) sound slide film, 15 minutes, 75 frames	$25.00	$25.00
"See For Yourself" (Home Lighting) sound slide film, 15 minutes, 105 frames	$30.00	$30.00
Wiring		
Rewiring for Commercial and Industrial Buildings	$0.25	$0.25
Basic Factors of Adequate Wiring—1939	.25	.25
Covered Neutral Cable Helps Sell Adequate Home Wiring—1939	.25	.25
Commercial Building Re-wiring Market—1939	.35	.35
(Price on above three books as a group is 60c per set)		
Films		
Commercial Re-Wiring — lantern slides	Set $17.50	
Home Wiring—lantern slides	Set 25.00	

Miscellaneous, Reference Books, etc.

	Members	Non-Members
M-13—Specifications for Impregnated Paper-Insulated Lead Covered Cable, "Solid" Type, "Oil-Filled" Type	Single copies	$1.00
	10 or more "	.85
Code for Electricity Meters (1941)	$1.60	$2.00
Good Radio Reception (1937)	100 copies	4.00
	1000 "	25.00
	3000 "	60.00
	5000 "	95.00
Objective Type Rates, 1933-1936	.80	2.00
Ice and Wind Loading Tables for Overhead Line Conductors (Revision of Tables 85 to 96 of the Overhead System Reference Book) 1942	1-4 copies	10c.
	5-49 "	6c.
Power Sales Manual, plus Sec. 12-13-14-15	5.35	7.60
Rate Book for 1943	10.00	25.00
Rewiring for Commercial and Industrial Buildings (1941)	.25	.25
Sales Training Manual—Commercial Electric Cooking (1941)	1.50	1.50
Storm Loading and Strength of Wood Pole Lines and a Study of Wind Gusts (1936)	2.00	5.00
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power Output; Montbly Electrical Research Statistics)	2.00	2.00

Periodicals

Better Light—Better Sight News (9 issues yearly)	$0.75	$0.75
Edison Electric Institute Bulletin (Monthly)	2.00	2.00
Rural Electrification Bulletin (5 issues yearly)		1.00

Changes in Motor Starting Rules

(*Continued from page* 18)

modify existing regulations to permit infrequently started equipment, such as room air conditioners, to be installed on residential 115 volt circuits when the locked rotor current does not exceed 40 amperes.

The EEI group of the joint subcommittee feels that ACRMA is to be highly commended for their prompt recognition of the utilities' problems and for their courage in adopting a course of action which at least initially may react adversely from a commercial standpoint. In this action by ACRMA, the EEI representatives believe that a concession of extreme value to the utilities has been gained and unanimously recommend the necessary parallel action by the Transmission & Distribution Committee, EEI; namely, that this Committee recommend to EEI members the general amendment of motor starting rules to permit locked rotor currents not exceeding 40 amperes for infrequently started single phase motors operating at lighting voltage. Such action has two distinct advantages:

(1) Member companies of ACRMA produced about 85 per cent of the prewar volume of room coolers and will attempt to maintain or improve this position. The influence of that organization directed along the lines it has approved should materially reduce distribution system requirements and problems.

(2) In taking a realistic view of the situation, it must be anticipated that new companies not affiliated with ACRMA will enter the field post-war, and that ACRMA's influence may not be 100 per cent effective among its own members, just as an action by EEI may not be 100 per cent effective; from these sources as well as from other post-war appliance manufacturers may come a heavy influx of high starting current 115-volt motors. The position of the utility industry will be the stronger in taking whatever action may later be necessary if it can point to the fact that already on a nationwide basis it has liberalized permissible starting currents to the maximum consistent with present distribution knowledge and practice.

Payne Becomes EEI Statistician

GEORGE B. PAYNE has returned to the Edison Electric Institute as Statistician, after three years service with the U. S. Navy. Mr. Payne replaces Merle Rainey, who resigned some time ago.

A graduate of Brown University in 1934, Mr. Payne was with the Institute's Statistical Department for eight years before joining the Navy.

In his work as Statistician, Mr. Payne will compile the Institute's weekly, monthly and annual electric output reports, and will supervise statistical compilations and analyses on all phases of operations within the electrical industry.

While with the Navy, Mr. Payne served as a Lieutenant aboard the aircraft carrier "Manila Bay" in the Pacific area. He was Fighter Director Officer for the carrier, with duties including the gathering of combat intelligence of enemy operations, and the use of radar equipment to intercept Japanese aircraft.

CONVENTIONS AND MEETINGS

JANUARY

18-19	Southeastern Electric Exchange, Labor Negotiations Committee, St. Petersburg, Fla.
21-25	American Institute of Electrical Engineers, New York, N. Y.

FEBRUARY

4-5	National Association of Purchasing Agents, Public Utility Buyers' Group, Midwinter Convention, Edgewater Beach Hotel, Chicago, Ill.
6-7	Pennsylvania Electric Association, System Operation Committee, Roosevelt Hotel, Pittsburgh, Pa.
7-8	Accident Prevention Committee, EEI, Deshler Wallick Hotel, Columbus, Ohio.
7-8	Pennsylvania Electric Association, Transmission and Distribution Committee, Benjamin Franklin Hotel, Philadelphia, Pa.
11-12	Canadian Electrical Association, Winter Meeting, Chateau Frontenac, Quebec City, Que., Can.
11-12	Prime Movers Committee, EEI, Hotel Coronado, St. Louis, Mo.
13-14	Missouri Valley Electric Association, Power Sales Conference, Hotel Continental, Kansas City, Mo.
14-15	Pennsylvania Electric Association, Electrical Equipment Committee, Roosevelt Hotel, Pittsburgh, Pa.
18-19	Transmission and Distribution Committee, EEI, Netherland Plaza Hotel, Cincinnati, Ohio.
20-21	Electrical Equipment Committee, EEI, Netherland Plaza Hotel, Cincinnati, Ohio.
25-28	American Society for Testing Materials, Pittsburgh, Pa.

MARCH

1	American Society for Testing Materials, Pittsburgh, Pa.
10-14	North Central Electrical Industries, Radisson Hotel, Minneapolis, Minn.
14-15	Southeastern Electric Exchange, Engineering and Operation Section, Birmingham, Ala.
21-22	Southeastern Electric Exchange, Accounting Conference, Charleston, S. C.

APRIL

1-3	Meeting of Gas and Electric Industry Accountants, Netherland Plaza Hotel, Cincinnati, Ohio.
1-3	The American Society of Mechanical Engineers, Spring Meeting, Chattanooga, Tenn.
1-4	Twelfth Annual Sales Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.
3-5	Midwest Power Conference, Palmer House, Chicago, Ill.
8-12	National Electrical Manufacturers Association, Spring Meeting, Palmer House, Chicago, Ill.
10-12	Missouri Valley Electric Association, Engineering Conference, Hotel Continental, Kansas City, Mo.
21-25	National Electrical Wholesalers Association, Stevens Hotel, Chicago, Ill.
24-26	Southeastern Electric Exchange, Annual Conference, Edgewater Gulf Hotel, Edgewater Park, Miss.
29-May 1	Chamber of Commerce of the U. S. A., Atlantic City, N. J.

MAY

6-8	Engineering Committees, EEI, Edgewater Beach Hotel, Chicago, Ill.
14-16	Southeastern Electric Exchange, Home Economics Conference, Atlanta, Ga.
23-24	Southeastern Electric Exchange, Power Sales Conference, Asheville, N. C.
28-29	Pennsylvania Electric Association, Engineering Section, Penn Harris Hotel, Harrisburg, Pa.

JUNE

3-5	EDISON ELECTRIC INSTITUTE, Waldorf Astoria Hotel, New York, N. Y.
3-6	National District Heating Association, The Cavalier, Virginia Beach, Va.
3-6	National Fire Protection Association, Hotel Statler, Boston, Mass.
17-19	National Electrical Manufacturers Association, The Homestead, Hot Springs, Va.

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